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ABSTRACT

This teacher's guide was developed to help teachers (especially in Oklahoma) promote safe practices on the job. As a supplement to existing programs in the requirements for job safety, this book can also promote same basic safety attitudes and help support basic safety concepts, with an emphasis on accident prevention. The guide contains eight units that cover the following topics: personal protective equipment, housekeeping, materials handling, hand tools, power tools and machines, guarding, hazardous materials, and fire prevention. Each unit contains objectives, suggested resources, equipment needed, lesson presentation outline, specifications, rules, self-tests, and answers to self-tests. (KC)

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SAFETY ON THE JOB

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SOME GUIDELINES FOR WORKING SAFELY

INSTRUCTOR'S EDITION

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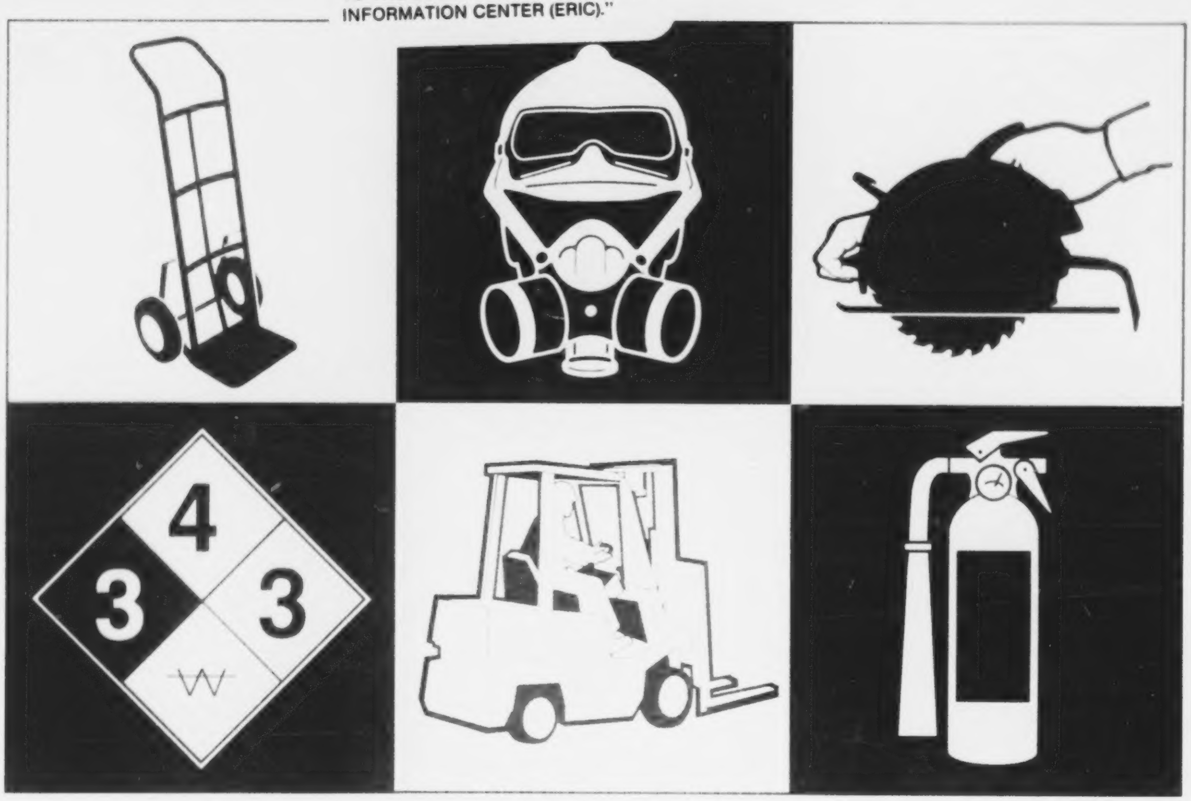

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OKLAHOMA CIMC

Oklahoma State Department of
Vocational and Technical Education
Stillwater, Oklahoma

SAFETY ON THE JOB

Some Guidelines for Working Safely

- Instructor

prepared by

Curriculum and Instructional Materials Center
Oklahoma State Department of Vocational and Technical Education
Roy Peters, Jr., Director
Oklahoma State Board of Vocational and Technical Education
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Safety standards and guidelines may change. It remains your responsibility to understand and follow all current safety regulations and practices.

This book is a source of supplemental safety training only. This book is not intended to represent a complete safety training program. You should use this book in addition to your existing safety training materials.

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NOTE: The following disclaimer refers to the NSC publications referenced in this book.

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FOREWORD

Job-related accidents and injuries involve human, material, and financial costs. Non-injury accidents, if left unreported, can also be as expensive as accidents that cause injuries, because the unreported accident has the potential to occur again. In addition, the results of an accident may not become visible to the injured person immediately, but can have far-reaching effects. This book is the result of a statewide concern for the safety of individuals while at their job sites.

The purpose of this book is to promote awareness of safe practices on the job. This greater awareness might contribute toward reducing the costs associated with job-related accidents and injuries.

As a supplement to existing programs in the requirements for job safety, this book can also promote some basic safety attitudes and help support basic safety concepts.

The Oklahoma State Department of Vocational and Technical Education shares the concerns of employers, employees, and educators in preventing accidents and injuries. As a result, the theme of this book is accident prevention.

Think safety first and be aware of the safety conditions around you.

Roy Peters, Jr., Director
Oklahoma State Department of
Vocational and Technical Education

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Craig A. Maile
Technical Writer

PURPOSE OF THIS BOOK

This book and each of the individual units are a safety resource only. They should not be used as a substitute for comprehensive safety training in each of the safety areas discussed. Each job site and facility is different, and the job-related hazards at each workplace are different. You should use this book to supplement your existing safety training. Your safety training program should reflect the specific hazards that exist in your workplace.

The scope of this book is limited. All possible job-related hazards and safety requirements cannot be covered in this book. To be complete, your training program should cover the specific hazards and requirements for your workplace, including specific tools, machines, and equipment. Use this book as a guide. Adapt it to your safety needs.

USING THIS BOOK

1. Use the information in this book as extra safety training only
2. Follow the manufacturer's recommendations for proper use and maintenance of any tool or piece of equipment
3. Follow the job safety rules and guidelines established at your job site and in your profession

   NOTE: This book is not complete and does not represent a complete job safety training program.
4. Ask your safety supervisor or other designated person at your job site if you have safety questions about your specific work area and job site

INSTRUCTOR'S GUIDELINES

General Guidelines

NOTE: Specific instructor's guidelines for each unit are on the left-hand pages of each unit. Each set of instructor's guidelines on the left-hand page applies to the information on the immediate right-hand page.

1. TEACH each unit as supplemental safety training

   IMPORTANT: Each unit is not a substitute for a comprehensive safety and accident prevention program for your job site.

2. ADAPT each unit to the needs of your job site

   NOTE: Use the pages that apply. Insert extra pages of safety rules and guidelines for topics important at your job site that are not included in these units.

3. USE your job site to illustrate safety rules and guidelines, when possible

   NOTE: Refer to the machines, tools, equipment, layout, policies, etc., at your job site when discussing each topic.

4. DISCUSS the importance of safety in terms of (a) the safety of each employee and (b) the effects of accidents and accident prevention on job performance and output

5. REFER to 29 CFR 1910 of the OSHA General Industry Safety and Health Standards for added safety rules

   NOTE: Check the Standards before each presentation for any added safety information that could apply to each topic.

6. INVOLVE participants as much as possible

   NOTE: Create role-plays, discuss possible scenarios at your job site, include question-and-answer sessions, etc., to include participants in your presentations.

7. DISCUSS the specific hazards and possible accidents at your job site for each topic and suggest ways to prevent those accidents

8. EXPLAIN or REVIEW your policies and guidelines for each topic

9. SUPPLEMENT unit discussions with available films and videotapes

   NOTE: You may find other sources for films and videotapes to include with each unit. Insert these materials where needed.

INSTRUCTOR'S GUIDELINES

General Guidelines

10. POINT OUT "success stories" at your job site that apply to each topic

11. INITIATE poster-designing contests for participants and their children, covering the safety topics in this book and at your job site

INSTRUCTOR'S GUIDELINES

Self-Tests

1. COMPLETE the Self-Tests as a "pre-test" or "post-test"

   NOTE: The Self-Tests are in this Instructor's Guide only.

2. EXPLAIN that the Self-Tests are not graded

   NOTE: Each Self-Test measures general understanding only. The Self-Tests are not a measure of any level of competency achieved, and they do not reflect the total content of any unit in this program. The Self-Tests are the basis for in-class review of the topic(s) covered on the Self-Test.

3. DISCUSS (as a group) each answer choice

   EXAMPLE: Discuss why the other choices are not correct answers to the stated question. Also explain, when possible, the situations in which the other choices would be correct.

4. ASK different participants to answer each question

5. REFER to the specific topic in each unit, when needed, to answer any question

6. BE SURE that participants correct their answers to every Self-Test question before they continue

   NOTE: Participants can later use the Self-Tests and answers for their own review.

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Personal Protective Equipment

Personal Protective Equipment

Personal Protective Equipment

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Personal Protective Equipment

Personal Protective Equipment

INSTRUCTOR'S GUIDELINES

OBJECTIVE: The objective of this presentation is to instruct participants in the common types of personal protective equipment available, and the hazards that they protect against. The goal of this presentation is to promote awareness of the role of personal protective equipment in preventing accidents and injuries on the job.

1. USE this unit as a source of supplemental safety training in personal protective equipment

2. ORDER or OBTAIN supplemental training materials for your presentation

   a. Films and videotape

      (1) Don't Push Your Luck. Color, 12 minutes, 16 mm or 3/4 inch videotape. Available from Harvest AV, Inc., 98 Riverside Drive, New York, NY 10024

      (2) Safety On The Job Series: The Air-Purifying Respirator. Color, 13 minutes, VHS. Available from AIMS Media, 6901 Woodley Avenue, Van Nuys, CA 91406-4878, or toll-free at (800) 367-2467

      (3) Safety On The Job Series: The Air-Supplied Respirator. Color, 12 minutes, VHS. Available from AIMS Media (See 2 above)

      (4) Respiratory Protection (a 4-part series). Color, VHS. Available from Summit Training Source, Inc., 6504 28th Street S.E., Grand Rapids, MI 49506

   b. Written materials

      (1) 29 CFR 1910 of the OSHA General Industry Safety and Health Standards -- Selected sections as needed

      (2) ANSI Z87.1 (Current Edition), Practice for Occupational and Educational Eye and Face Protection

      ANSI Z89.1 (Current Edition), Protective Headwear for Industrial Workers

      ANSI Z41 (Current Edition), Safety-Toe Footwear

      Available from American National Standards Institute, 1430 Broadway, New York, New York 10018

(3) Accident Prevention Manual for Industrial Operations--Administration and Programs (Current Edition), from the National Safety Council

For current catalog, write or call the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois, 60611 or 1-800-621-7619; or contact the Oklahoma Safety Council, P.O. Box 14686, Oklahoma City, Oklahoma 73113 or (405) 848-8626

(4) Sound Sense for You and Your Hearing (booklet), from the National Safety Council

Pocket Guide to Industrial Respiratory Protection (booklet), from the National Safety Council

Protect Your Eyes (booklet), from the National Safety Council

See the address and phone number listed under (3)

(5) Safety posters, available from the National Safety Council in their Poster Directory (Current Edition)

See the address and phone number listed under (3)

(6) Equipment catalogs for the personal protective equipment used at your job site

c. Chalkboard, flip chart, chalk, marking pens, etc.

3. LIST the different types of personal protective equipment used at your job site by the types of hazards present

HINT: Ask participants to identify the kinds of hazards present in their work areas, then list types of personal protective equipment available to protect against those hazards.

4. USE equipment catalogs to illustrate types of equipment used at your job site, if needed

NOTE: This unit does not contain illustrations for each item presented in the unit.

5. ASK participants about the role of each type of personal protective equipment used in their work area(s)

HINT: Discuss these questions at the appropriate time in your presentation. You could ask about each of the types of personal protective equipment as you discuss each type.

6. EXPLAIN or REVIEW your company's safety policies or guidelines for using each type of personal protective equipment

INSTRUCTOR'S GUIDELINES

Introduction

1. DISCUSS each of the "Considerations" as guidelines that participants should follow whenever they use personal protective equipment

   Consideration 1 -- Participants must know how to properly and safely use their machines, equipment, and tools. Personal protective equipment is an extra safety device and cannot replace safety awareness on the job

   Consideration 2 -- Each machine, piece of equipment, or tool has special safety rules to follow. Personal protective equipment can help protect against different types of hazards. However, participants must always follow the specific safety rules for the machines, equipment, and tools that they are using

   Consideration 3 -- In addition to following the safety rules for their machines, equipment, and tools, participants must be aware of other unexpected hazards, such as flying wood chips from a saw, etc.

   Consideration 4 -- Personal protective equipment is an extra safety device in addition to specific safety rules and safety awareness, not a substitute

2. EMPHASIZE the importance of proper maintenance to the effectiveness of personal protective equipment

PERSONAL PROTECTIVE EQUIPMENT

INTRODUCTION

1. Never consider any type of personal protective equipment as your "first line of defense" against safety hazards on the job
2. Do not substitute personal protective equipment in place of following proper safety rules on the job
3. Use personal protective equipment to help protect you from the unexpected or the unusual
4. Think of personal protective equipment as an extra safety device when all other safety measures fail

INSTRUCTOR'S GUIDELINES

Eye and Face Protection -- Hazards Requiring Eye and Face Protection

1. GIVE examples of each hazard from the list that applies to your job site (add examples not on the list, if needed)

   HINT: Ask participants to identify examples of hazards in their work area(s) requiring eye and face protection.

2. ASK for examples (or describe situations yourself) of the possible accidents and injuries that result from failing to use the right type of personal protective equipment

3. ASK for examples of personal protective equipment used at your job site to help protect against these hazards

4. SUPPLEMENT your discussion with the booklet Protect Your Eyes, from the National Safety Council

PERSONAL PROTECTIVE EQUIPMENT

EYE AND FACE PROTECTION

Hazards Requiring Eye and Face Protection

NOTE: This list is not complete.

Explosions and flashes

Impact of flying objects, particles, dust and chips

Glare and radiation (harmful rays)

Heat

High pressure sprays, hoses, and tools

Sparks, splashes, splatters

INSTRUCTOR'S GUIDELINES

Eye and Face Protection -- OSHA Minimum Requirements

1. REFER to 29 CFR 1910.133 for the minimum requirements for protectors

2. ASK participants to answer each question that follows each OSHA requirement

   HINT: Each question can lead into a group discussion of the answers.

3. EXPLAIN your company's policies or guidelines for any eye and face protection that does not meet the OSHA minimum requirements

PERSONAL PROTECTIVE EQUIPMENT

EYE AND FACE PROTECTION

OSHA Minimum Requirements
(29 CFR 1910.133)

Protectors must

1. PROVIDE adequate protection against the particular hazards for which they are designed

   QUESTION: Why is it important to choose the right type of eye and face protection for the job?

2. BE reasonably comfortable when worn under the designated conditions

   QUESTION: What could happen if eye and face equipment cannot be worn comfortably?

3. FIT snugly without greatly interfering with the wearer's movements

   QUESTION: Why is the right fit important?

4. BE durable

   QUESTION: Why must eye and face equipment be durable?

5. BE capable of being disinfected

   QUESTION: What could happen if eye and face equipment cannot be disinfected?

6. BE KEPT clean and in good repair

   QUESTION: How can clean and well-maintained eye and face equipment increase the level of protection of the equipment?

INSTRUCTOR'S GUIDELINES

Eye and Face Protection -- Goggles

1. DISCUSS the types of goggles used at your job site, and the general types of protection they offer

   HINT: Use examples of the hazards at your job site, in addition to the listed hazards.

2. SHOW examples of the goggles used at your job site

3. EXPLAIN your policies for when and how to use each type of goggles at your job site

   HINT: Do you have the manufacturer's information about the proper use of the equipment?

PERSONAL PROTECTIVE EQUIPMENT

EYE AND FACE PROTECTION

Goggles
(Frontal and Side Protection)

Type		Protection (from)*
1.	Eyecup	Impact hazards -- flying objects, particles, dust and chips
2.	Flexible-fitting	Fine dust, fumes, mists
		Splashes, splatters, sprays
		Liquids hazards
		Impact hazards -- less protection than eyecup goggles
3.	Plastic Eyeshield	Light flying objects and chips
		Glare and radiation in low concentrations (if so designed)
4.	Chipping	Impact hazards -- maximum protection from flying particles
5.	Welding	Impact hazards -- flying particles
		Glare and radiation (harmful rays)
		Sparks
		Heat, molten (liquefied) metal
6.	Laser	Laser beams -- protect against specific wavelengths

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*General types of protection only. Always use goggles that protect against specific eye hazards. Consult a safety specialist and follow the manufacturer's instructions for use.

INSTRUCTOR'S GUIDELINES

Eye and Face Protection -- Safety Spectacles

1. DISCUSS the types of safety spectacles used at your job site, and the general types of protection they offer

   HINT: Use examples of the hazards (and safety spectacles) at your job site, in addition to the listed hazards.

2. SHOW examples of the safety spectacles used at your job site

3. EXPLAIN your policies for when and how to use each type of safety spectacles at your job site

   HINT: Do you have the manufacturer's information about the proper use of the equipment?

PERSONAL PROTECTIVE EQUIPMENT

EYE AND FACE PROTECTION

Safety Spectacles*

Type	Uses
1. Metal, plastic, or combination frame	Light chipping operations, grinding, and machine tool operations Operations involving impact hazards--flying objects, particles, dust and chips With filter lenses and combined with a face shield -- furnace operations, molten metal handling, spot welding
2. Plastic eyeshield	Same as (1) -- less durable than metal, plastic, or combination frame

*Safety spectacles without sideshields offer frontal protection only.

INSTRUCTOR'S GUIDELINES

Eye and Face Protection -- Face Shields

1. **EMPHASIZE** that a face shield alone does not offer enough protection

2. DISCUSS the listed operations requiring face shields, and specific operations at your job site

   HINT: Explain that even the basic plastic window face shield is, by itself, not enough eye protection for some operations.

3. SHOW examples of the face shields used at your job site

   HINT: Explain the uses of each type at your job site and in specific work areas.

PERSONAL PROTECTIVE EQUIPMENT

EYE AND FACE PROTECTION

Face Shields*

Type		Operations
1.	Chemical-resistant	Severe chemical hazards involving splashes, fumes, splatters
2.	Plastic window	With proper eye protection -- splashes of molten metals
		With proper eye protection -- glare and radiation, intense rays
		With proper eye protection -- sparks, flying objects and particles
3.	Mesh window or Heat-resistant	Radiant heat

*A face shield alone does not offer enough protection against impact hazards. Always wear the proper type of eye protection (goggles and/or safety spectacles) with the face shield.

INSTRUCTOR'S GUIDELINES

Eye and Face Protection -- Selection Guide

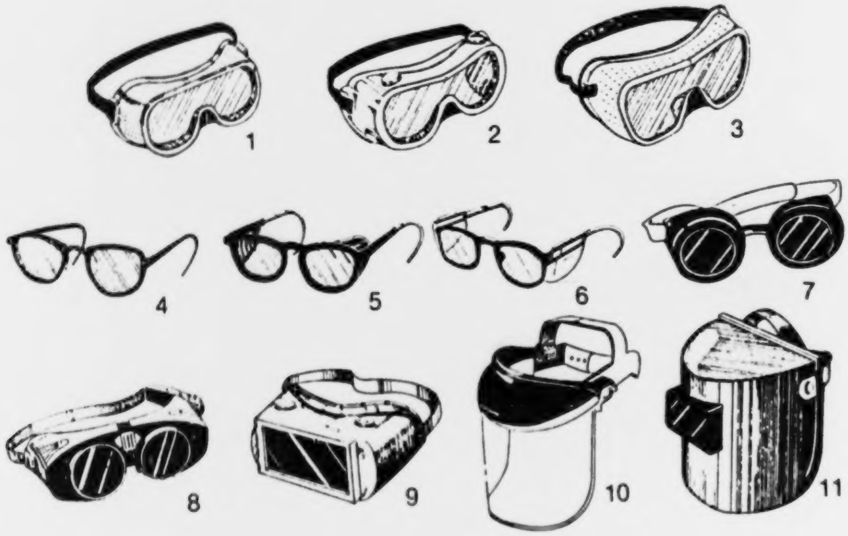
1. REFER to the standards in ANSI Z87.1 (Current Edition) for complete guidelines in selecting safety eyewear
2. STATE that many hazards require more than one type of protector
3. SHOW examples of combinations of safety eyewear required for any jobs at your job site

PERSONAL PROTECTIVE EQUIPMENT

EYE AND FACE PROTECTION

Selection Guide

This chart is adapted from ANSI Standard Z87.1-1979. This Guide offers general recommendations only. Management and safety specialists are responsible for the final choice of eye and face protection.



1. Goggles, Flexible Fitting, Regular Ventilation
2. Goggles, Flexible Fitting, Hooded Ventilation
3. Goggles, Cushioned Fitting, Rigid Body
4. Spectacles, without Sideshields
5. Spectacles, Eyecup-Type Sideshields
6. Spectacles, Semi- or Flat-Fold Sideshields
7. Welding Goggles, Eyecup-Type, Tinted Lenses (Shown)

7A. Chipping Goggles, Eyecup-Type, Clear Safety Lenses

8. Welding Goggles, Coverspec Type, Tinted Lenses (Shown)

8A. Chipping Goggles, Coverspec Type, Clear Safety Lenses

9. Welding Goggles, Coverspec Type, Tinted Plate Lens
10. Face Shield, Plastic or Mesh Window
11. Welding Helmet

INSTRUCTOR'S GUIDELINES

Eye and Face Protection -- Filter Lens Shade Numbers for Welding and Cutting

1. REFER to the types of operations that exist at your job site
2. EMPHASIZE that participants using goggles for welding and cutting must also use the right shade number(s)

PERSONAL PROTECTIVE EQUIPMENT

EYE AND FACE PROTECTION

Filter Lens Shade Numbers for Welding and Cutting*

LENS SHADE SELECTOR

Type of operation	Shade number
Soldering	2
Torch brazing	3 or 4
Oxygen cutting	
0 - 1 inch	3 or 4
1 - 6 inches	3 or 5
6 inches and over	5 or 6
Gas welding	
0 - 1/8 inch	4 or 5
1/8 inch to 1/2	5 or 6
1/2 inch and over	6 or 8
Shielded metal arc welding 1/16, 3/32, 1/8, 5/32 inch electrodes	9 - 14
Arc cutting	12 - 14
Gas metal arc welding	9 - 14
Gas tungsten arc welding Nonferrous, gas metal arc welding 1/16, 3/32, 1/8, 5/32 inch electrodes	9 - 14
Gas tungsten arc welding (ferrous), gas metal arc welding (ferrous) 1/16, 3/32, 1/8, 5/32 inch electrodes	9 - 14

*For welders and helpers.
Used with permission from Introduction To Welding, Mid-America Vocational Curriculum Consortium, Inc., Stillwater, Oklahoma. 1984.

INSTRUCTOR'S GUIDELINES

Eye and Face Protection -- General Safety Rules

Rule 1 List different jobs at your job site, and the required personal protective equipment for each job (or have participants make the list)

Rule 2 Give examples that show increasing levels of protection

EXAMPLE: Safety spectacles, safety spectacles plus face shield, safety spectacles plus face shield plus protective helmet, etc.

Ask for examples of the possible accidents and injuries that happen when the level of protection does not equal the level of the hazard

Rule 3 Give examples of hazards and the required types of lenses

NOTE: Do your company's policies already specify lens types?

Rule 4 Describe possible hazards that require more than frontal protection (hazards that require sideshields)

Rule 5 Explain that the use of contact lenses with eye and face protection must be approved on a case-by-case basis

Emphasize the CAUTION

HINT: Contact OSHA and/or NIOSH for their guidelines on the use of contact lenses with eye and face protection.

PERSONAL PROTECTIVE EQUIPMENT

EYE AND FACE PROTECTION

General Safety Rules

NOTE: Follow all OSHA, state, employer's, and manufacturer's regulations.

1. USE the right equipment for the job

2. CONSIDER the type of hazard, the degree of each hazard, and the level of protection needed

   NOTE: If you have a choice between different goggles, safety spectacles, and face shields that protect against the same type and degree of hazard, use the item that offers the highest level of protection.

3. CHOOSE the right lenses for the job

   EXAMPLES: Glass or plastic, filtered, tinted, or clear, etc.

4. WEAR proper sideshields on safety spectacles when the hazard requires more than frontal protection alone

5. FOLLOW all OSHA guidelines for wearing contact lenses with eye and face protection

   CAUTION: CONTACT LENSES MAY CREATE A HAZARD WITH CERTAIN CHEMICALS AND PARTICLES AND CAN BADLY DAMAGE YOUR EYES IF WORN IN VIOLATION OF OSHA GUIDELINES. CONTACT LENSES ARE NOT A FORM OF EYE PROTECTION.

INSTRUCTOR'S GUIDELINES

Head Protection -- Hazards Requiring Head Protection

1. GIVE examples of each hazard from the list that applies to your job site (add examples not on the list, if needed)

   HINT: Ask participants to identify examples of hazards in their work area(s) requiring head protection.

2. ASK for examples (or describe situations yourself) of the possible accidents and injuries that result from failing to use the right type of personal protective equipment

3. ASK for examples of personal protective equipment used at your job site to help protect against these hazards

PERSONAL PROTECTIVE EQUIPMENT

HEAD PROTECTION

Hazards Requiring Head Protection

NOTE: This list is not complete.

Impact hazards

Puncture/Penetration hazards

Electric shock

Entanglement of hair in machinery

Falling objects

Bumping into suspended or moving objects or stock

INSTRUCTOR'S GUIDELINES

Head Protection -- General Safety Rules

Rule 1	List the jobs or work areas at your job site that require head protection, and the type of protection required Emphasize the NOTE -- Give (or ask for) examples of possible accidents and injuries if proper head protection is not worn
Rule 2	Explain what to look for (use sample equipment) Emphasize the CAUTION Explain what could happen if head protection equipment is not inspected before every use
Rule 3	Ask why this rule is important
Rule 4	Emphasize the NOTE
Rule 5	Emphasize the NOTE
Rule 6	Describe situations or jobs at your job site where such head protection would be a hazard Emphasize the NOTE

PERSONAL PROTECTIVE EQUIPMENT

HEAD PROTECTION

General Safety Rules

NOTE: Follow all OSHA, state, employer's, and manufacturer's regulations.

1. WEAR the right type of head protection designated for the job or work area

   NOTE: Your job may only briefly expose you to hazards requiring head protection, such as when entering a "hard hat area." Your exposure to such hazards may be short, but the consequences of failing to follow proper safety rules can be long-lasting.

2. INSPECT all head protection equipment before using it

   CAUTION: NEVER USE DEFECTIVE, DAMAGED, OR UNSAFE EQUIPMENT.

3. COVER your head completely

   NOTE: Do not push any protective helmet or hair cap to the back of your head. This could reduce the level of protection offered by the equipment.

4. KEEP the visor of a hair cap in place covering your forehead

   NOTE: The visor warns you of contact with a moving object.

5. DO NOT CARRY anything inside a protective helmet

   NOTE: The empty space inside the helmet is needed to absorb the shock of any blow.

6. DO NOT WEAR metal protective helmets or other metal head protection where electrical hazards or materials corrosive to aluminum are present

   NOTE: Know the hazards involved with any job, and the head protection required for those hazards.

INSTRUCTOR'S GUIDELINES

Foot Protection -- Types and Uses

1. REFER to the standards in ANSI Z41 (Current Edition) for complete information about the requirements for foot protection

2. DISCUSS the different types of foot protection and their uses

   HINT: Discuss the types of foot protection required at your job site.

3. LIST (or ask for) examples of specific uses of foot protection at your job site

   HINT: Ask participants to describe the hazards in their work area(s).

PERSONAL PROTECTIVE EQUIPMENT

FOOT PROTECTION

Types and Uses

NOTE: This list is not complete.

Type	Uses*
Safety Toe	Handling heavy materials Working around rolling objects such as barrels, drums, pipes, wheeled equipment, etc Working with hazards involving sharp objects underfoot
Conductive	Draining-off static charges Reducing chances of sparks in areas with fire/explosion hazards
Foundry	Working with hazards involving splashes from molten metal -- foundry shoes are quickly removable in an emergency, to reduce the risk of serious burns from splashed molten metal
Non-Sparking	Working where floors are non-conductive and grounded Cleaning tanks and other storage areas where volatile materials are kept, such as gasoline
Electrical Hazard	Reducing the hazards from contact with electric current where the path of the current runs from the point of contact to the ground

*General uses only. Always follow the manufacturer's instructions for proper use and safety. Consult a safety specialist if needed to determine your footwear requirements.

From Accident Prevention Manual for Industrial Operations--Administration and Programs (9th Edition), National Safety Council, 444 North Michigan Avenue, Chicago, IL 60611. 1988.

INSTRUCTOR'S GUIDELINES

Foot Protection -- General Safety Rules

Rule 1	List the jobs or work areas at your job site that require foot protection
	Emphasize the NOTE -- Give (or ask for) examples of possible accidents and injuries if proper foot protection is not worn
Rule 2	Emphasize the NOTE
Rule 3	Give examples of jobs or work areas at your job site where metatarsal guards are required
Rule 4	Give examples of jobs or work areas at your job site where these items are required
	Show examples of each item
Rule 5	Emphasize and explain the CAUTION

PERSONAL PROTECTIVE EQUIPMENT

FOOT PROTECTION

General Safety Rules

NOTE: Follow all OSHA, state, employer's, and manufacturer's regulations.

1. USE the right type of foot protection for the job

   NOTE: Know the hazards involved with any job, and the foot protection required for those hazards.

2. CHOOSE the correct size shoe

   NOTE: Protective shoes should not pose a hazard due to discomfort or poor fit.

3. WEAR metatarsal (over-foot) guards on protective shoes to protect your feet from impact hazards behind your toes

4. COVER the tops of foundry shoes with pant legs, spats, or leggings to keep out molten metal and other hot materials

5. DO NOT USE electrical hazard shoes that are damp or badly worn

   CAUTION: SHOES IN THIS CONDITION ARE NOT DEPENDABLE.

INSTRUCTOR'S GUIDELINES

Hand and General Body Protection -- Types and Operations

1. DISCUSS the types of hand and general body protection, and the general operations where each is used

   HINT: Add the operations at your job site where each item is used.

2. SHOW examples of each item used at your job site

3. EXPLAIN your policy for using hand and general body protection:

   a. What items must participants use on the job?
   b. When must participants use each item?
   c. What condition must each item be in before each use?

PERSONAL PROTECTIVE EQUIPMENT

HAND AND GENERAL BODY PROTECTION

Types and Operations

NOTE: This list is not complete.

Type	Operations*
Gloves -- Cotton or Canvas	Light job tasks
Gloves -- Leather or Metal-Reinforced Leather	Rough or abrasive materials
	Edged tools, sharp edges
Gloves -- Plastic or Plastic-Coated	Washing and soaking (protection varies by glove type)
	Hazardous chemicals (protection varies by glove type)
Gloves -- Rubber	Electrical hot work (specially-made and tested types)
Arm Protectors	Where extended arm protection is required (protection varies by hazard and protector material)
Aprons	Sparks, splatters, and splashes of liquids and hot metals (protection varies by apron material)
Coats	Grease, dirt, and dust
	Chemicals and hot materials (protection varies by coat material)

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*General types of operations only. Always use the right equipment for the job. Follow the manufacturer's instructions for proper use and safety.

INSTRUCTOR'S GUIDELINES

Hand and General Body Protection -- General Safety Rules

Rule 1	List the jobs or work areas at your job site that require hand and general body protection
	Emphasize the NOTE -- Give (or ask for) examples of possible accidents and injuries if proper protection is not worn
Rule 2	Demonstrate the correct way to inspect items -- Explain what to look for
	Show examples of defective, damaged, or worn equipment
	Explain your policy for replacing defective, damaged, or worn equipment
Rule 3	Emphasize the CAUTION
Rule 4	Explain why this rule is important
	Emphasize the CAUTION
Rule 5	Explain why this rule is important
Rule 6	Explain why the order of the steps is important

PERSONAL PROTECTIVE EQUIPMENT

HAND AND GENERAL BODY PROTECTION

General Safety Rules

NOTE: Follow all OSHA, state, employer's, and manufacturer's regulations.

1. USE the right equipment for the job

   NOTE: Know the hazards involved with any job, and the hand and general body protection required for those hazards.

2. INSPECT all gloves, aprons, coats, arm protectors and other equipment before each use

   NOTE: Depending on the types of hazards present, defective, damaged or worn equipment can be dangerous. For example, gloves for handling toxic chemicals or irritants would no longer offer enough protection if a tear or hole is found in the glove. You should throw away equipment that cannot protect you well for the hazards of the job.

3. DO NOT WEAR gloves around moving machinery

   CAUTION: THE GLOVE COULD BE CAUGHT BY A DRILL, SAW, GRINDER, OR OTHER MOVING PART AND BE PULLED INTO THE MACHINE OR TOOL.

4. KEEP coat sleeves, loose aprons, and apron strings away from moving machinery

   CAUTION: DO NOT WEAR THESE ITEMS AROUND MOVING MACHINE OR TOOL PARTS.

5. DO NOT WEAR gloves with metal parts or metal reinforcement around electrical equipment or electrical hazards

6. REMOVE equipment step-by-step after each use

Hearing Protection -- Hearing Damage or Loss Factors

1. SUPPLEMENT your discussion with copies of Sound Sense for You and Your Hearing, from the National Safety Council
2. ASK participants how each factor influences the amount of hearing damage or loss
3. REFER to 29 CFR 1910.95 for OSHA regulations covering noise exposure

Hearing Protection -- OSHA Requirements for Hearing Protectors

1. EXPLAIN the responsibilities of employers and employees
2. EXPLAIN your company's policies and procedures

PERSONAL PROTECTIVE EQUIPMENT

HEARING PROTECTION

Hearing Damage or Loss Factors

1. Sound level in each work area
2. Length of exposure to high sound levels
3. Individual characteristics of workers

OSHA Requirements for Hearing Protectors (29 CFR 1910.95(i))*

1. Who must provide hearing protectors? The employer.
2. Who must wear hearing protectors? Employees exposed to an 8-hour time-weighted average of 85 decibels or more.
3. Who must pay for hearing protectors? The employer.
4. When must hearing protectors be replaced? As needed.

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*See 29 CFR 1910.95 for complete regulations covering noise exposure.

INSTRUCTOR'S GUIDELINES

Hearing Protection -- Amounts of Hearing Loss

1. EXPLAIN the differences between the amounts of hearing loss that are possible

   HINT: The possible amounts of hearing loss are also the possible consequences from poor practices on the job (and off the job).

2. DISCUSS situations/operations at your job site where such losses are possible

PERSONAL PROTECTIVE EQUIPMENT

HEARING PROTECTION

Amounts of Hearing Loss

Temporary loss -- Possible after exposure to high-level sounds for a period of minutes or hours

NOTE: Hearing usually returns after a rest period of minutes or days.

Permanent loss -- Possible after continued, repeated exposure to high levels of sound

NOTE: Hearing may never return to its normal level.

INSTRUCTOR'S GUIDELINES

Hearing Protection -- Advantages and Disadvantages

1. SHOW samples of each type of protection
2. DISCUSS the advantages and disadvantages
3. EXPLAIN your policy for using each type

PERSONAL PROTECTIVE EQUIPMENT

HEARING PROTECTION

Advantages and Disadvantages

Enclosure Protector

ADVANTAGES

Encloses the user's head completely
(reduces sound levels due to the design of the enclosure)

May allow for other types of protective equipment (goggles, helmet, etc.)

Can be used to meet specific needs

Can be worn with insert protectors

DISADVANTAGES

Costs more than other types of protectors

Causes discomfort from heat if worn for any length of time

Is bulky

PERSONAL PROTECTIVE EQUIPMENT

HEARING PROTECTION

Advantages and Disadvantages

Ear Insert Protector (Earplugs)

ADVANTAGES

Costs less

Adapts to the form of the user's ear (if the custom-molded type is used)

DISADVANTAGES

Has a limited service life

May not fit perfectly (loss of effectiveness)

May cause discomfort (if the pre-molded type is used)

PERSONAL PROTECTIVE EQUIPMENT

HEARING PROTECTION

Advantages and Disadvantages

Canal Cap Protector

ADVANTAGES

Covers the outside edge of the ear canal (instead of an insert)

DISADVANTAGES

May not fit perfectly (loss of effectiveness)

PERSONAL PROTECTIVE EQUIPMENT

HEARING PROTECTION

Advantages and Disadvantages

Earmuff (Cup) Protector

ADVANTAGES

Covers the outside of the ear (acts as an outside barrier to sound)

DISADVANTAGES

Is affected by head size and shape, and by the protector material and design (loss of effectiveness)

May allow noise to get through

INSTRUCTOR'S GUIDELINES

Hearing Protection -- General Safety Rules

Rule 1	Describe "higher than normal" sound levels that participants should report Explain your policy or procedures for evaluating noise levels (employer's responsibility)
Rule 2	Describe ways for participants to safely control noise levels in their work area(s), in addition to controls used by the employer
Rule 3	List the jobs or work areas at your job site that require hearing protection Show examples of your required hearing protectors and show how they should be used Discuss types of hearing protection that is not allowed
Rule 4	Ask for examples of possible accidents and injuries when hearing protection is not used Explain that hearing loss can be long-lasting

PERSONAL PROTECTIVE EQUIPMENT

HEARING PROTECTION

General Safety Rules

NOTE: Follow all OSHA, state, employer's, and manufacturer's regulations.

1. REPORT high noise levels in your work area(s)

   NOTE: The employer is responsible for evaluating noise levels. (See 29 CFR 1910.95)

2. CONTROL noise levels in your work area(s)

   EXAMPLES: Use engineering controls, layout of machines and equipment, equipment attachments, or other ways to control noise levels.

3. WEAR the right type of hearing protector for the job

   NOTE: Choose the right type of protector for the job and for the sound levels in your work area(s).

4. USE hearing protectors when and where required

   NOTE: Wear hearing protectors when you need to wear them, not just when you want to wear them.

INSTRUCTOR'S GUIDELINES

Respiratory Protection -- Hazards Requiring Respiratory Protection

1. GIVE examples of each hazard from the list that applies to your job site (add examples not on the list, if needed)

   HINT: Ask participants to identify examples of hazards in their work area(s) requiring respiratory protection.

2. ASK for examples (or describe situations yourself) of the possible accidents and injuries that result from failing to use the right type of respiratory protection

3. ASK for examples of personal protective equipment used at your job site to help protect against these hazards

4. SUPPLEMENT your discussion with the booklet Pocket Guide to Industrial Respiratory Protection, from the National Safety Council

PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION

Hazards Requiring Respiratory Protection

NOTE: This list is not complete.

Lack of oxygen
(oxygen deficiency)

Dangerous contamination from
gases or vapors

Contamination from particles
such as dust, fog, fumes,
mists, smoke, or spray

Combinations of these hazards

INSTRUCTOR'S GUIDELINES

Respiratory Protection -- Selection Factors

1. DESCRIBE how each factor influences the selection of respiratory protective equipment

   HINT: Ask participants why each factor is important.

2. EXPLAIN your policy for selecting respiratory protective equipment

3. REFER to 29 CFR 1910.134 for complete information about respiratory protection

PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION

Selection Factors

1. The nature of the hazardous operation or process
2. The type of air contaminant -- its physical and chemical properties, effects on the body, and its concentration
3. The period of time during which respiratory protection must be provided
4. The location of the hazard area(s) with respect to a source of uncontaminated and breathable air
5. The state of health of the user(s)
6. The physical and operating characteristics of the respiratory equipment
7. The extent of the employer's compliance with requirements for testing, equipment, and programs

INSTRUCTOR'S GUIDELINES

Respiratory Protection -- General Safety Rules

Rule 1 List the jobs or work areas at your job site that require respiratory protection (and explain why such protection is needed)

Give (or ask for) examples of possible accidents and injuries if respiratory protection is not used

Rule 2 Demonstrate how to use each required type of respiratory equipment: how to put it on, make adjustments, use in a hazardous situation, respond to emergency situations, and remove the equipment

Explain the limitations of each item -- Refer to the manufacturer's instructions

Have participants demonstrate how to use each item

HINT: Ask other participants to review the performance of each person's demonstration.

Rule 3 Show examples of masks and correct filters for the hazards present (use the color code)

Explain what could happen if the wrong filter is chosen

Rule 4 Explain how each person's face is different -- the same mask will not fit perfectly on all persons

State that masks should never be borrowed -- use only the mask that fits you

Describe factors that contribute to a poor fit, such as facial hair, wrong type of mask, poor adjustment of mask, etc.

Rule 5 Demonstrate how to clean any required equipment

Rule 6 Show what to look for on each item

Explain why it is important to inspect equipment before and after each use: what could happen if defective, damaged, or worn equipment is used?

Rule 7 Identify the storage areas and procedures for respiratory equipment at your job site

PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION

General Safety Rules

NOTE: Follow all OSHA, state, employer's, and manufacturer's regulations.*

1. USE the right type of respiratory protection for the job

   NOTE: Know the hazards involved with any job, and the respiratory protection required for those hazards.

2. KNOW how to use the right type of respiratory protection for the job

   NOTE: You must also know the limitations of the equipment that you will use.

3. USE the right filter

   NOTE: Have all filters replaced as needed. Do not substitute filters that do not protect against the respiratory hazards present.

4. CHECK your mask for a tight fit before using the mask

   NOTE: If the mask does not fit well, then it cannot protect you against exposure to the respiratory hazard present. Use only a well-fitting mask.

5. CLEAN all respiratory equipment after each use

6. INSPECT all respiratory equipment before and after each use

7. STORE all respiratory equipment properly after each use

   NOTE: Return all respiratory equipment to a convenient, clean storage area after each use, according to your company's guidelines.

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*See 29 CFR 1910.134 for complete guidelines.

INSTRUCTOR'S GUIDELINES

Lifelines

Rule 1 List the jobs or work areas at your job site that require lifelines

Emphasize the NOTE -- Give (or ask for) examples of possible accidents and injuries if lifelines are not used

Rule 2 Discuss rope materials with respect to the hazards present: Are electrical or corrosion hazards present where the ropes are used, etc?

Show examples of the ropes used at your job site

Rule 3 Give examples of manufacturer's instructions for care of rope lines and wire lines

Rule 4 State that open coils can help prevent sharp bends in lifelines and the hazards that can result

Rule 5 Explain and show what to look for

Emphasize the NOTE and explain your policy for removing lifelines from service

Safety Belts and Harnesses

Rule 1 List the jobs or work areas at your job site that require safety belts and harnesses

Emphasize the NOTE -- Give (or ask for) examples of possible accidents and injuries if safety belts and harnesses are not used

Rule 2 Explain and show what to look for

Emphasize the NOTE and explain your policy for removing safety belts and harnesses from service

Rule 3 Give examples of manufacturer's instructions for the safety belts and harnesses used at your job site

PERSONAL PROTECTIVE EQUIPMENT

LIFELINES, SAFETY BELTS, AND HARNESSES

NOTE: Follow all OSHA requirements.

Lifelines

1. USE the right type of lifeline for the job

   NOTE: Know the hazards involved with any job, and the lifelines needed for those hazards.

2. CHOOSE the right material for lifelines

   NOTE: Know the advantages of different rope materials.

3. MAINTAIN lifelines according to the manufacturer's instructions

   Rope Lines -- Do not expose to high temperatures

   Wire Lines -- Lubricate often and keep lines clean and dry

4. STORE lines in open coils

   NOTE: Do not bend lifelines sharply and never use defective, damaged, or worn lifelines.

5. INSPECT all lifelines before and after each use

   NOTE: You should remove from service any defective, damaged, or worn lifelines immediately.

Safety Belts and Harnesses

1. USE the right type of safety belt and harness for the job

   NOTE: Know the hazards involved with any job, and the safety belts and harnesses needed for those hazards.

2. INSPECT all safety belts and harnesses before each use

   NOTE: You should remove from service any defective, damaged, or worn safety belts and harnesses immediately.

3. MAINTAIN safety belts and harnesses according to the manufacturer's instructions

PERSONAL PROTECTIVE EQUIPMENT
SELF-TEST 1

1. Identify four (4) hazards requiring eye and face protection.

   ____

   ____

   ____

   ____

2. When choosing eye and face protection, you should consider

   a. the type of hazard
   b. the degree of each hazard
   c. the level of protection required
   d. all of the above
   e. none of the above

3. When should you wear proper sideshields on safety spectacles?

   a. When the hazard requires frontal protection only
   b. When the hazard requires more than frontal protection alone
   c. To protect against glare and radiation hazards only
   d. To protect against impact hazards only

4. Which of the following is NOT an OSHA minimum requirement for eye and face protectors?

   a. Be durable
   b. Fit snugly without greatly interfering with the wearer's movements
   c. Provide adequate protection against the particular hazards for which they are designed
   d. Be kept clean and in good repair
   e. All are OSHA minimum requirements

PERSONAL PROTECTIVE EQUIPMENT
SELF-TEST 2

1. Identify four (4) hazards requiring head protection.

    ____

    ____

    ____

    ____

2. You should cover your head

    a. partially
    b. completely
    c. if comfortable to do so
    d. if you have time to do so

3. The empty space inside a helmet is needed to absorb the shock of any blow. Therefore, you should

    a. not carry anything inside a protective helmet
    b. not wear a protective helmet where a blow could occur
    c. be sure that anything that you carry inside your helmet will not use all of the empty space
    d. push the helmet to the back of your head when you are carrying something inside your helmet

PERSONAL PROTECTIVE EQUIPMENT
SELF-TEST 3

1. Which type of foot protection is used to reduce the chances of sparks in areas with fire or explosion hazards?

    a. Safety Toe
    b. Foundry
    c. Conductive
    d. Electrical Hazard

2. Which of the following is NOT a use for safety toe foot protection?

    a. Handling heavy materials
    b. Draining-off static charges
    c. Working around rolling objects such as barrels, drums, pipes, wheeled equipment, etc.
    d. Working with hazards involving sharp objects underfoot

3. Which type of foot protection is used to work with hazards involving sharp objects underfoot?

    a. Safety Toe
    b. Conductive
    c. Foundry
    d. Non-Sparking

PERSONAL PROTECTIVE EQUIPMENT
SELF-TEST 4

1. Which of the following operations could involve the use of cotton or canvas gloves?

   a. Edged tools, sharp edges
   b. Electrical hot work
   c. Light job tasks
   d. Washing and soaking

2. You should not wear gloves

   a. where hazardous chemicals are present
   b. around moving machinery
   c. when you are working with sharp edges
   d. when your job involves electrical hot work

3. What should you keep away from moving machinery?

   a. Coat sleeves
   b. Loose aprons
   c. Apron strings
   d. All of the above
   e. None of the above

PERSONAL PROTECTIVE EQUIPMENT
SELF-TEST 5

1. Identify three (3) hearing damage or loss factors.

   ____

   ____

   ____

2. Which of the following is NOT one of the disadvantages of ear insert protectors (earplugs)?

   a. Has a limited service life
   b. May not fit perfectly
   c. May cause discomfort
   d. Is bulky

3. Which of the following are advantages of enclosure protectors?

   a. Encloses the user's head completely
   b. May allow for other types of protective equipment
   c. Can be worn with insert protectors
   d. Can be used to meet specific needs
   e. All of the above

4. You should use hearing protectors

   a. when required
   b. where required
   c. both (a) and (b)
   d. when you want to wear them
   e. none of the above

PERSONAL PROTECTIVE EQUIPMENT
SELF-TEST 6

1. Identify three (3) hazards requiring respiratory protection.

   ____

   ____

   ____

2. Check your mask for a tight fit

   a. before using the mask
   b. while using the mask
   c. after using the mask
   d. only when using a mask for the first time

3. Inspect all respiratory equipment

   a. before each use
   b. after each use
   c. before and after each use
   d. only when you notice a problem with the equipment

4. Clean all respiratory equipment

   a. before each use
   b. after each use
   c. if told to do so
   d. only when you notice a problem with the equipment

PERSONAL PROTECTIVE EQUIPMENT
SELF-TEST 7

Complete each statement.

1. Rope Lines -- Do not expose to __________ temperatures.

2. Wire Lines -- Lubricate often and keep lines __________ and _____.

3. Store lines in __________ coils.

4. Use the right type of safety belt and __________ for the job.

5. __________ all safety belts and harnesses __________ each use.

PERSONAL PROTECTIVE EQUIPMENT
ANSWERS TO SELF-TESTS

NOTE: Check the appropriate pages in this unit for more information or explanations.

SELF-TEST 1

1. any four hazards; 2. d; 3. b; 4. e

SELF-TEST 2

1. any four hazards; 2. b; 3. a

SELF-TEST 3

1. c; 2. b; 3. a

SELF-TEST 4

1. c; 2. b; 3. d

SELF-TEST 5

1. any three factors; 2. d; 3. e; 4. c

SELF-TEST 6

1. any three hazards; 2. a; 3. c; 4. b

SELF-TEST 7

1. high; 2. clean, dry; 3. open; 4. harness; 5. Inspect, before

2 2 2 2 2 2 2 2

Housekeeping

Housekeeping

Housekeeping

Housekeeping

Housekeeping

Housekeeping

Housekeeping

Housekeeping

Housekeeping

INSTRUCTOR'S GUIDELINES

OBJECTIVE: The objective of this presentation is to instruct participants in basic housekeeping practices and the value of proper industrial housekeeping in job safety. Discuss the safety guidelines presented in this unit as supplemental safety rules. Participants should always follow all necessary OSHA guidelines.

1. USE this unit as a source of supplemental safety training in basic housekeeping practices

2. ORDER or OBTAIN supplemental training materials for your presentation

    a. Films and videotape

        (1) Take Two for Safety (Individual tapes in a series). Available from Du Pont Safety Services. For more information, call 1-800-532-SAFE

    b. Written materials

        (1) 29 CFR 1910 of the OSHA General Industry Safety and Health Standards -- Selected sections as needed

        (2) Accident Prevention Manual for Industrial Operations--Engineering and Technology (Current Edition), from the National Safety Council

        For current catalog, write or call the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois 60611 or 1-800-621-7619; or contact the Oklahoma Safety Council, P.O. Box 14686, Oklahoma City, Oklahoma 73113 or (405) 848-8626

        (3) Best's Safety Directory (Current Edition), from the A.M. Best Company, Ambest Road, Oldwick, New Jersey 08858 or (201) 439-2200

        (4) Safety posters, available from the National Safety Council in their Poster Directory (Current Edition)

        See the address and phone number listed under (2)

    c. Chalkboard, flip chart, chalk, marking pens, etc., for diagrams that will be visible to all participants in the room

4. DEFINE your company's housekeeping standards

   HINT: This unit is not complete. You should also discuss the housekeeping practices required in other areas at your job site and in specific work areas.

5. DEFINE the responsibilities for housekeeping in every work area

   HINT: Explain which of the housekeeping areas in this unit are the responsibility of all participants while on the job and which are the responsibility of maintenance personnel. If maintenance personnel are needed to correct an unsafe situation, how should participants report these conditions when they find them?

6. EXPLAIN how housekeeping ties-in with all work areas and all operations

7. TOUR your job site and note the condition of specific work areas, then describe those work areas at the appropriate time during your presentation -- ASK participants to identify good housekeeping practices being followed, based on the situations you describe, and have participants suggest ways to improve housekeeping practices in each situation

8. MOTIVATE participants by outlining the benefits of good housekeeping on the job

   HINT: Give examples of "before" and "after."

INSTRUCTOR'S GUIDELINES

Work Areas

1. EXPLAIN your policy for housekeeping by specific work areas within your job site

2. MAKE a list of the different types of work areas represented by your participants

   HINT: From this list, you can use specific examples relating to the listed work areas as you discuss the General Safety Rules that follow.

3. DISCUSS each of the General Safety Rules

Rule 1	Describe possible hazards in different work areas from poor arrangement of equipment and machinery (or ask participants to describe hazards) Give possible solutions to situations that involve poor arrangement of equipment and machinery
Rule 2	Outline your company policy for tool management Give examples of accidents from unsafe storage of tools and materials
Rule 3	Explain how an organized work area leads to greater safety and productivity (give examples) Describe possible hazards from trash or poor organization
Rule 4	Explain any local, state, or federal regulations Explain the proper way to dispose of different types of trash and wastes
Rule 5	Describe possible hazards from obstacles and spilled substances Show examples of warning signs, barricades, or other ways to warn persons of hazards, used at your job site
Rule 6	Describe possible hazards and accidents
Rule 7	Show examples of housecleaning supplies used at your job site Emphasize the NOTE -- Describe possible accidents

HOUSEKEEPING

WORK AREAS

1. ARRANGE equipment and machinery for clear, safe working areas and ease in maintenance

2. STORE tools and materials in their proper places

3. ORGANIZE your work area and keep it clear of trash and other hazards

4. THROW AWAY trash and waste materials properly

   IMPORTANT: Follow all local, state, and federal regulations for disposing of any hazardous materials.

5. CLEAR floors of obstacles and spilled substances immediately

   NOTE: You should also use barricades, warning signs, flags or other methods to warn other persons of long-term and temporary hazards in your work area!

6. KEEP all aisles, exits, and traffic areas clear

7. HAVE plenty of housecleaning supplies on hand for your work area

   NOTE: Do not use compressed air to clean yourself or your clothing!

INSTRUCTOR'S GUIDELINES

Aisles and Passageways

1. REFER to 29 CFR 1910.22(a-b)
2. DEFINE the responsibilities for housekeeping at your job site
3. DISCUSS each of the General Safety Rules

Rule 1	Explain your identification system Ask participants to explain your identification system and why they think such identification is important Emphasize the NOTE and the guidelines for portable fire extinguishers -- Refer to 29 CFR 1910.157(c-d)
Rule 2	Describe a "safe clearance" and the possible accidents from allowing an "unsafe clearance" Give examples of work areas at your job site where safe clearances are important (are they already marked?)
Rule 3	Give examples of obstructions and the accidents they can cause
Rule 4	Give examples of work areas at your job site where this rule applies, and the accidents that are prevented by following this rule
Rule 5	Relate this rule to Rule 3 Describe the correct places to keep materials, equipment, and machines out of aisles and passageways
Rule 6	Describe the hazards and possible accidents Explain the safety devices at your job site to reduce the hazards

HOUSEKEEPING

AISLES AND PASSAGEWAYS

NOTE: Follow all OSHA guidelines.

1. IDENTIFY all permanent aisles, passageways, loading areas, and fire fighting equipment

   NOTE: Do not block access to any fire-fighting equipment!

   For Portable Fire Extinguishers -- Portable fire extinguishers must be mounted, located, and identified so that employees have ready access to them without the risk of injury

2. KEEP a safe clearance for powered industrial trucks, hand trucks, and other mechanical handling equipment at all times

   NOTE: Keep aisles, doorways, corners, loading docks and other areas clear for the safe movement of materials handling equipment and vehicles.

3. REMOVE any obstructions in aisles and passageways that could create hazards

   NOTE: Aisles and passageways must allow for the safe handling of materials in any given area.

4. PROVIDE covers and/or guardrails where aisles or passageways are near open pits, tanks, vats, ditches, or similar hazards

5. KEEP materials, equipment, and machines out of aisles and passageways

6. WARN about the hazards of blind corners and clearance limits with signs, convex mirrors, and other devices

INSTRUCTOR'S GUIDELINES

Floors

1. REFER to 29 CFR 1910.22, 23

2. DEFINE the responsibilities for housekeeping at your job site

3. DISCUSS each of the General Safety Rules

Rule 1 Explain how these hazards could cause accidents

Rule 2 Explain why this rule is important

Emphasize the CAUTION

Rule 3 Describe the way floor loads are posted at your job site

Refer to 29 CFR 1910.22(d)(2)

Rule 4 Describe the hazards and possible accidents

Outline your company policy for tool and equipment management

Identify storage areas at your job site, and any procedures required for removing and returning tools and equipment

Rule 5 Give examples of work areas at your job site where this rule applies

Rule 6 Give examples of work areas at your job site where this rule applies

Rule 7 Explain the safety markings used at your job site, and where they are located

Ask participants to explain the importance of keeping safety markings visible, and ask for examples of possible accidents from "hidden" safety markings

Rule 8 Give examples of surfaces requiring specific materials such as tiles, etc.

HOUSEKEEPING

FLOORS

NOTE: Follow all OSHA guidelines.

1. REMOVE any protruding nails, splinters, loose boards, or other projections and hazards before they become a safety hazard to other persons

2. KEEP floors as dry as possible at all times

   CAUTION: CLEAN UP SPILLS IMMEDIATELY. WET FLOORS AND OTHER SURFACES CREATE ELECTRICAL AND OTHER HAZARDS.

3. FOLLOW the maximum safe floor loads for storage areas, as posted

   NOTE: Following safe floor loads is a legal requirement, not just a guideline. See 29 CFR 1910.22(d)(2) for details.

4. KEEP floors clear of tools and equipment that are not in use

   NOTE: Store all tools and equipment correctly in their proper storage areas.

5. GUARD all ladderways, stairways, and floor holes with the correct railings, covers, and toeboards

6. PROTECT access to open-sided floors, walkways, platforms, or runways near or above dangerous equipment with the correct railings and toeboards

7. DO NOT COVER any safety markings that are painted or posted on floors

   NOTE: These markings include aisles, doorways, load limits, loading/unloading areas, direction of traffic, etc.

8. REPAIR or REPLACE floor surfaces with materials appropriate for the use(s) of the surface

INSTRUCTOR'S GUIDELINES

Stairways

1. REFER to 29 CFR 1910.23(d) and 1910.24

2. DEFINE the responsibilities for housekeeping at your job site

3. DISCUSS each of the General Safety Rules

Rule 1	Give examples of obstructions and the accidents they can cause Emphasize the NOTE -- Refer to your company policy for storing tools and equipment
Rule 2	Describe hazards and possible accidents from poor lighting on stairways Ask participants to describe possible accidents
Rule 3	Explain your system for identifying stairways
Rule 4	Explain what could happen if handrails are loose, at the wrong height, or are slick or hard to grab
Rule 5	Ask for other examples of tripping hazards Emphasize the CAUTION
Rule 6	Explain the hazards and possible accidents
Rule 7	Define a "riser" Describe possible damage to risers and the hazards that result -- Emphasize the NOTE
Rule 8	Give examples of work areas at your job site where non-slip surfaces are used Demonstrate how to identify a badly-worn surface

HOUSEKEEPING

STAIRWAYS

NOTE: Follow all OSHA guidelines.

1. KEEP all stairways clear of tools, equipment, and other obstructions

   NOTE: Trash must be collected and not allowed to pile up. Tools and equipment must be stored in specific storage areas, not in walkways.

2. MAINTAIN the proper lighting for stairways

   NOTE: Replace burned-out light bulbs and faulty light fixtures immediately.

3. IDENTIFY the location of stairways with the correct signs or other markings

4. INSTALL and MAINTAIN handrails -- check all handrails for tightness, height, and grip

   NOTE: Flights of stairs having 4 or more risers must have a standard railing on all open sides. Closed stairways must have handrails on at least one side.

5. CHECK all stairways for tripping hazards such as loose runners or carpet, nails, and other objects

   CAUTION: DO NOT STORE MATERIALS ALONG ANY STAIRWAY OR AT THE TOP OR BOTTOM OF ANY STAIRWAY.

6. INSPECT all stairways for wet or slick areas

   IMPORTANT: Clean-up any wet or slick areas on stairways immediately.

7. REPAIR any damaged stairway risers

   NOTE: Check that the risers are in good condition and do not present hazards themselves (even if they are clear).

8. INSTALL the right kind of non-slip surface on stairways, if needed

   NOTE: Non-slip surfaces may also have to be replaced if they are badly worn and offer little protection.

INSTRUCTOR'S GUIDELINES

Storage Areas

1. IDENTIFY the designated storage areas at your job site

   HINT: Discuss any designated storage rooms as well as the storage areas at each work area.

2. DEFINE the responsibilities for housekeeping at your job site

3. DISCUSS each of the General Safety Rules

   Rule 1 Describe situations at your job site where stored materials could slide or fall

   Emphasize the NOTE -- Give examples of approved containers and stacking/storing methods used at your job site

   Show participants how to read the safe stacking guidelines found on many containers and boxes

   Rule 2 Describe the markings used in your storage rooms on floors and walls (draw the layout of the storage room on a chalkboard, if possible)

   Explain how markings in storage rooms protect the stored material and the handler from damage or injury from poor clearance between stored materials, poor methods of stacking, etc.

   Rule 3 Refer to the rules for aisles and passageways

   Explain the often restricted space in storage rooms and the special importance of keeping aisles and passageways in storage rooms clear

   Rule 4 Identify the locations of this equipment in your storage rooms

   State that participants should check to be sure that fire fighting equipment in storage rooms is not blocked

   Rule 5 Summarize the reasons for keeping space clear

   Rule 6 Explain your company policy for storing these and other materials

   HINT: Discuss the types of materials that should and should not be stored together and why; explain that storing materials does not reduce the possibility of an accident if the material is not stored correctly.

HOUSEKEEPING

STORAGE AREAS

NOTE: Follow all OSHA guidelines.

1. SECURE all stored materials from sliding or falling

   NOTE: Store materials in approved containers and stack containers only to their safe stacking height. Hand tools can also slip and fall if you do not store them safely during and after use.

2. LABEL all storage areas inside all storage rooms clearly

   NOTE: Do not cover any safety or other markings on floors or walls in storage areas.

3. KEEP aisles and passageways clear for the safe handling of stored materials

4. IDENTIFY clearly the locations of all fire fighting equipment kept in storage areas

   NOTE: Do not block access to any fire fighting equipment.

5. MAINTAIN enough space in storage rooms for the safe movement of mechanical handling equipment in aisles, at loading docks, through doorways, around corners, and in other areas

6. CONTROL all stored materials that could create tripping, fire, explosion, or pest control hazards

INSTRUCTOR'S GUIDELINES

Exits

1. REFER to 29 CFR 1910.37

2. IDENTIFY the locations of exits from each work area

   HINT: Ask participants to identify the locations of the exits from their work areas, before you do so.

3. DEFINE the responsibilities for housekeeping at your job site

4. DISCUSS each of the General Safety Rules

Rule 1	State that exits must be clear, should an accident or emergency occur
Rule 2	Define a "way of approach" Explain that exits must be clear on both sides of the doorway
Rule 3	Describe the exit signs used at your facility State that participants should report or replace any unlighted exit signs, according to company policy
Rule 4	Refer to Rule 2 Identify the different directions of exit travel for the exits at your job site
Rule 5	List the different signs or other markings used at your job site to identify doors, passages, or stairways that are not exits
Rule 6	Explain the hazards and possible accidents
Rule 7	Emphasize this rule

HOUSEKEEPING

EXITS

NOTE: Follow all OSHA guidelines.

1. KEEP all exits clear of obstructions at all times
2. MAINTAIN clear ways of approach to and from exits at all times
3. IDENTIFY all exits with easily visible and suitable lighted exit signs

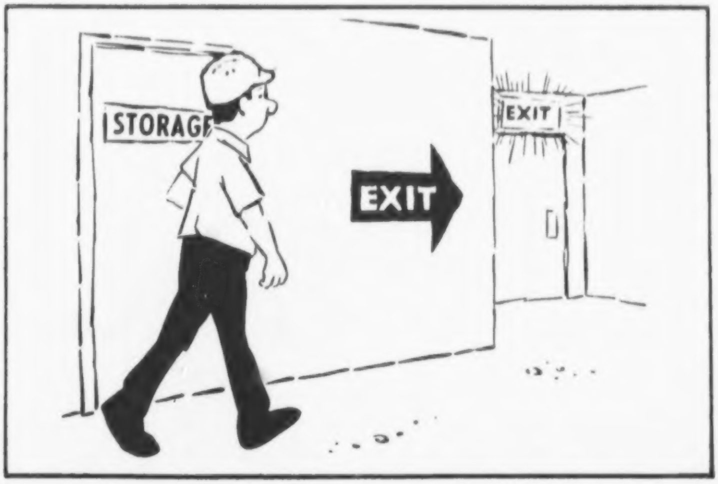
   NOTE: Exit signs should have a distinct color and should stand out from their surroundings.

4. CLEAR the immediate area around exit doors to allow the door(s) to swing in the direction of exit travel
5. LABEL all doors, passages, or stairways that are not exits or ways of approach to an exit with a sign stating "NOT AN EXIT"

   NOTE: You can also use specific labels, such as "To Basement," "To Stairway," etc., to show that the door, passage, or stairway is not an exit or way of approach to an exit.

6. DO NOT ARRANGE dangerous equipment in or near the path of exit travel, unless the path of travel is well-guarded from the hazards
7. DO NOT LOCK exit doors so that escape from the building or room is impossible

   NOTE: The exit must be usable in an emergency.



INSTRUCTOR'S GUIDELINES

Tools and Equipment

1. REFER to your company policies covering tools and equipment, as needed to discuss each rule

2. LIST examples of tools and equipment found in different work areas at your job site

   HINT: Refer to these specific tools as examples when you discuss each rule.

3. DEFINE the responsibilities for housekeeping at your job site

4. DISCUSS each of the General Safety Rules

   Rule 1 Show examples of sharp tools and dull tools, especially two examples of the same tool (sharp and dull)

   Demonstrate how the quantity and the quality of work changes when using sharp tools, as compared to using dull tools

   Rule 2 Outline your policy for tool management

   Rule 3 Show examples of defective tools and equipment that must be removed from service (immediately)

   Ask participants for other examples from their work areas, and explain how they can identify defective tools and equipment in their work areas

   HINT: Use your list of tools and equipment for different work areas as a guide.

   Rule 4 Show examples of tools with mushroomed heads, especially two examples of the same tool

   Explain your company policy for reshaping or repairing tools

   Rule 5 Describe possible hazards and accidents

   Emphasize the CAUTION

   Rule 6 Show examples of power tools and equipment needing repair

   Explain your company policy for repairing power tools and equipment

HOUSEKEEPING

TOOLS AND EQUIPMENT

1. KEEP all tools and equipment clean and in good working condition

   NOTE: Keep sharp tools sharp and guarded.

2. STORE tools and equipment in their proper storage areas when not in use

3. REMOVE any defective tools and equipment from service

4. RESHAPE hand tools and power tool attachments that have mushroomed heads

   EXAMPLES: Chisels, screwdrivers, drill bits, hammer heads, wedges, etc.

5. TURN OFF power equipment when not in use or when adjustments or attachments are needed

   CAUTION: UNPLUG POWER TOOLS AND EQUIPMENT BEFORE REPAIRING.

6. REPAIR or REPLACE any power tools and equipment showing signs of worn, deteriorated, or poor insulation or other parts

INSTRUCTOR'S GUIDELINES

Electrical Equipment

1. REFER to 29 CFR 1910.303
2. IDENTIFY the locations at your job site of the electrical equipment covered under 29 CFR 1910.303
3. DEFINE the responsibilities for housekeeping at your job site
4. CONSULT a qualified electrician, if needed, before presenting the General Safety Rules
5. DISCUSS each of the General Safety Rules

   Rule 1 Explain how to comply with the NOTE

   Identify (or ask participants to identify) areas at your job site where other hazards could exist near electrical equipment

   Offer ways to correct any hazardous situations

   Rule 2 Explain what could happen if conductors are not properly covered

   Rule 3 Show examples of electrical equipment clearly marked

   Rule 4 Ask participants for examples of situations at their work areas where accidental contact with live parts could occur

   Offer ways to correct any hazardous situations (or explain your company policy)

   Rule 5 Ask participants why this rule is important

   Emphasize the NOTE

   Rule 6 Describe the warning signs used at your job site

   Ask participants to describe the warning signs (have they noticed the signs?)

   Rule 7 Explain the fire hazards that result

   Show examples of power cords and describe their uses

   Discuss the diagram "Examples of Hazards"

HOUSEKEEPING

ELECTRICAL EQUIPMENT

NOTE: Follow all OSHA guidelines.

1. KEEP electrical equipment away from electrocution hazards, cutting hazards, and other dangerous areas and equipment

   NOTE: Enclose or isolate any parts of electric equipment that create arcs, sparks, flames, or molten metal from all combustible material.

2. COVER all splices, joints and free ends of conductors with insulation equal to that of the conductor or with a proper insulating device

3. SHOW voltage, current, wattage, and other ratings clearly on all electrical equipment

   NOTE: Be sure that all labels and other markings are readable.

4. GUARD live parts of equipment against accidental contact by using approved cabinets, enclosures, or by locating the equipment to reduce the hazard

5. KEEP the working spaces around electric equipment clear (and guarded, if the working space is in a passageway or a general open space)

   NOTE: Do not use working spaces around electric equipment for storage. Be sure that these spaces are always clear.

6. MARK all entrances to guarded electrical locations with warning signs

7. DO NOT OVERLOAD power outlets by using more electrical cords than the outlet can handle

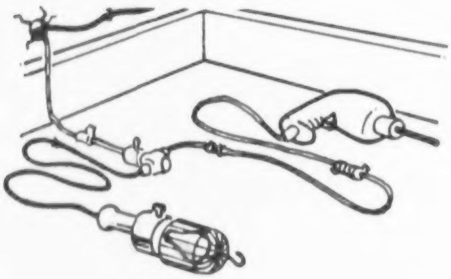
   NOTE: Also use the proper type of cord for the job.

HOUSEKEEPING

ELECTRICAL EQUIPMENT

NOTE: Follow all OSHA guidelines.

Examples of Hazards



1 Cords running through holes in wall and attached to building surfaces -- Damage to surface could affect the attached cord; frayed cord could cause surface to burn

2 Tools left unattended; tools not stored -- Can create tripping hazards; exposed points can injure

3 Cord not properly spliced or replaced -- Can lead to fire and shock hazards

4 Cords frayed, poor insulation -- Can allow metal parts of tools to conduct electric current (shock hazards)

5 Cords and adapters used as substitute for fixed wiring -- Can lead to fire and shock hazards; adapters can become easily overloaded; cords can become tripping hazards; etc.

INSTRUCTOR'S GUIDELINES

Fire Fighting Equipment

1. REFER to 29 CFR 1910.157(a-g)

2. DEFINE the responsibilities for housekeeping at your job site

3. DISCUSS each of the General Safety Rules

Rule 1	Ask participants to identify the location of fire extinguishers in their work areas Identify the location of fire extinguishers in different work areas (how well did the participants identify these locations?)
Rule 2	Discuss the importance of regular inspection, and reloading when needed Ask participants about the possible results of using a fire extinguisher that is not in good working condition
Rule 3	Refer to the chart Emphasize the importance of keeping fire fighting equipment clear of obstructions all day and every day
Rule 4	Demonstrate how to inspect each type of extinguisher used at your job site **HINT:** Does your company designate persons to inspect extinguishers?
Rule 5	Same as Rule 4
Rule 6	Identify the location of all fire doors Emphasize the CAUTION
Rule 7	Explain why this rule is important (or ask participants to explain) Emphasize the NOTE

HOUSEKEEPING

FIRE FIGHTING EQUIPMENT

NOTE: Follow all OSHA guidelines.

1. KEEP the proper type of fire extinguishers where needed

2. KEEP fire extinguishers in good working condition

3. LOCATE fire extinguishers where they are easy to see and easy to reach

   NOTE: Be sure that extinguishers are located properly for the type(s) of fire possible.

4. INSPECT extinguishers visually every month

   NOTE: Keep accurate records of all inspections and service performed.

5. MAKE a maintenance check of all extinguishers every year

6. LABEL all fire doors

   CAUTION: NEVER BLOCK FIRE DOORS OR THE SIGNS THAT SHOW THE LOCATION OF A FIRE DOOR.

7. DO NOT BLOCK fire doors, electrical shut-offs, or emergency equipment at any time

   NOTE: Keep fire doors closed.

HOUSEKEEPING

FIRE FIGHTING EQUIPMENT

NOTE: Follow all OSHA guidelines.

Class of Fire	Travel Distance to Extinguisher
A	75 feet (22.9 meters) or less
B	50 feet (15.2 meters) or less
C	On the basis of the appropriate pattern for the existing Class A or Class B hazards
D	75 feet (22.9 meters) or less

*See 29 CFR 1910.157(a-g) for all of the rules relating to portable fire extinguishers.

INSTRUCTOR'S GUIDELINES

Fire Prevention

1. DISCUSS the role of housekeeping in fire prevention

   HINT: Ask participants how safe housekeeping practices can help prevent fires.

2. DISCUSS each of the General Safety Rules

Rule 1	Explain your company policy
Rule 2	Show examples of the proper containers used at your job site
Rule 3	Explain how to inspect these systems, and how often
Rule 4	Explain how often to clean these surfaces (your company policy)
Rule 5	Ask participants why this rule is important Show examples of approved safety containers used at your job site Emphasize the CAUTION
Rule 6	Explain any laws that participants must follow **HINT:** These legal guidelines should be part of your company policy.

HOUSEKEEPING

FIRE PREVENTION

1. FOLLOW a schedule for collecting all combustible wastes and trash

   NOTE: Follow your housekeeping rules for fire prevention every day.

2. COLLECT all combustible wastes and trash from all work areas every day

   NOTE: Use only the approved containers for combustible wastes and trash, such as noncombustible containers with self-closing lids.

3. CLEAN all ventilation ducts

   NOTE: Combustible materials are more dangerous when they are in the air than after they have settled on floors and other surfaces.

4. CLEAN all beams, overhead pipes, machines and other surfaces where dust or other combustible material can collect

5. KEEP only the minimum amount of flammable liquids needed for the job in any work area

   CAUTION: STORE FLAMMABLE LIQUIDS IN APPROVED SAFETY CONTAINERS ONLY. NEVER STORE FLAMMABLE LIQUIDS IN GLASS CONTAINERS.

6. FOLLOW all federal, state, and local laws about disposing of wastes and trash

   NOTE: Follow your company's disposal policy.

INSTRUCTOR'S GUIDELINES

Safety Color Code

1. DESCRIBE the purpose of each color

   IMPORTANT: Instruct all participants that DANGER signs indicate immediate danger and that special precautions are needed. CAUTION signs indicate a possible hazard requiring special precautions.

2. GIVE examples of each color as it is used at your job site

   HINT: First, ask participants if they can identify examples of each color code used at your job site. Have participants noticed the safety color code while on the job?

3. RELATE good housekeeping practices and the safety color code-- All signs, tags, and labels must be visible at all times in their appropriate locations

   HINT: Give examples of poor housekeeping practices that result in safety signs being hidden from view, removed, or damaged.

4. QUIZ participants (with their books closed) -- Describe how a color is used, then ask for the right color to match those uses

SAFETY COLOR CODE

Federal Safety RED

* Shows danger

* Labels fire protection equipment and its location

* Labels portable containers of flammable liquids

* Labels emergency stop bars, buttons, and electrical stop switches on machinery

Federal Safety YELLOW

* Shows caution and physical hazards

  EXAMPLES: Low beams, steps, pits.

* Labels waste containers for explosive or combustible materials

* Labels equipment that should not be started, used, or moved

  EXAMPLES: Defective equipment, equipment under repair.

* Shows the starting point or power source for machinery

Federal Safety ORANGE

* Labels dangerous parts of equipment that could cut, crush, shock or otherwise injure

* Labels safety starter buttons

Federal Safety PURPLE (or MAGENTA or BLACK ON YELLOW)

* Shows radiation hazards

HOUSEKEEPING

SAFETY COLOR CODE

Federal Safety BLUE

- Marks tags that indicate equipment that should not be started, used, or moved

Federal Safety GREEN

- Labels safety equipment (other than firefighting equipment) and its location
- Labels first-aid equipment and its location

Federal Safety BLACK AND WHITE

- Shows traffic flow paths
- Labels storage areas
- Labels housekeeping equipment and its location

INSTRUCTOR'S GUIDELINES

Machine Guards

1. REFER to 29 CFR 1910.211-222
2. DEFINE the responsibilities for checking machine guards
3. LIST the different types of machines at your job site that have guards
4. DISCUSS each of the General Safety Rules

Rule 1	Explain that this rule must be followed before each use of the machine
Rule 2	Show examples of the holding tools needed
	Explain where holding tools should and should not be kept
Rule 3	Describe your marking system for danger zones
	Explain the purpose of marking danger zones
	Emphasize the NOTE
Rule 4	Outline your company policy
Rule 5	Give examples of machines where this rule applies at your job site
Rule 6	Give examples of specific tools, machines, and guards
	Describe the items that should be checked
Rule 7	Outline your company policy

MACHINE GUARDS

NOTE: Follow all OSHA guidelines.

1. CHECK machines and tools regularly for the correct placement and operation of all guards required

2. STORE the right holding tools for placing and removing material near the work areas where the tools are used

3. MARK all danger zones on and around machines and tools

   NOTE: Be sure that markings are easily seen and are not blocked or covered.

4. REMOVE or adjust guards only if needed for maintenance and repair, and only if you are authorized to do so

   NOTE: Some guards are designed to be adjusted.

5. ANCHOR all machines designed for use in a fixed location

   NOTE: These machines should not move during normal operation, either as the result of anchoring or machine design.

6. INSPECT machines and tools for the correct guards protecting operators from moving machine parts and protecting the machine or tool from falling objects

7. REPAIR or REPLACE any defective equipment

HOUSEKEEPING
SELF-TEST 1

1. Clear floors of obstacles and spilled substances

   a. immediately
   b. as soon as possible
   c. only if told to do so
   d. when you have the time

2. In addition to permanent aisles, you should identify

   a. passageways
   b. loading areas
   c. firefighting equipment
   d. all of the above

3. Remove any protruding nails, splinters, loose boards, or other projections and hazards __________ they become a safety hazard to other persons

   a. after
   b. before
   c. whenever
   d. none of the above

4. Loose runners, loose carpet, nails, and other objects are examples of _________ hazards on stairways, and must be checked

   a. slipping
   b. fire
   c. tripping
   d. electrical

5. What must be kept clear for the safe handling of stored materials?

   a. Aisles and passageways
   b. Powered industrial trucks
   c. Handtrucks
   d. none of the above

6. Maintain clear ways of approach ________________ exits at all times

   a. to
   b. from
   c. to and from
   d. near

7. What kind of tools and equipment should be removed from service?

   a. Oily
   b. Sharp
   c. Insulated
   d. Defective

8. Repair or replace any power tools and equipment showing signs of

   a. wear
   b. deterioration
   c. poor insulation
   d. all of the above

9. When are power outlets in danger of being overloaded?

   a. When more electrical cords are used than the outlet can handle
   b. When fewer electrical cords are used than the outlet can handle
   c. When the right type of cord is used for the job
   d. Whenever the outlet is used

10. How are fire extinguishers properly located?

   a. Where they are easy to see
   b. Where they are easy to reach
   c. Both (a) and (b)
   d. None of the above

11. For a Class A fire, the travel distance to the extinguisher must be

   a. 75 feet or less
   b. 75 feet or more
   c. 50 feet or less
   d. 50 feet or more

12. For a flammable liquid needed for the job in any work area, how much should be kept in the work area?

   a. As much as can be stored in the work area
   b. Only the minimum amount needed for the job
   c. Both (a) and (b)
   d. None of the above

13. You should check machines and tools regularly for

    a. correct placement of all guards required
    b. correct operation of all guards required
    c. Both (a) and (b)
    d. None of the above

HOUSEKEEPING
SELF-TEST 2

1. Which of the following is true for Federal Safety RED?
   - a. Shows danger
   - b. Labels fire protection equipment and its location
   - c. Labels portable containers of flammable liquids
   - d. Labels emergency stop bars, buttons, and electrical stop switches on machinery
   - e. All of the above

2. Traffic flow paths, storage areas, and housekeeping equipment are indicated by
   - a. Federal Safety RED
   - b. Federal Safety YELLOW
   - c. Federal Safety BLACK AND WHITE
   - d. Federal Safety BLUE

3. First-aid equipment and its location is shown by
   - a. Federal Safety BLUE
   - b. Federal Safety YELLOW
   - c. Federal Safety ORANGE
   - d. Federal Safety GREEN

4. Tags used to indicate equipment that should not be started, used, or moved are identified by
   - a. Federal Safety RED
   - b. Federal Safety BLUE
   - c. Federal Safety YELLOW
   - d. Federal Safety PURPLE

HOUSEKEEPING
ANSWERS TO SELF-TESTS

NOTE: Check the appropriate pages in this unit for more information or explanations.

SELF-TEST 1

1. a; 2. d; 3. b; 4. c; 5. a; 6. c; 7. d; 8. d; 9. a; 10. c; 11. a; 12. b;
13. c

SELF-TEST 2

1. e; 2. c; 3. d; 4. b

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Materials Handling

Materials Handling

Materials Handling

Materials Handling

Materials Handling

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Materials Handling

INSTRUCTOR'S GUIDELINES

OBJECTIVE: The objective of this presentation is to instruct participants in the proper and safe ways to handle materials on the job. Discuss the safety guidelines presented in this unit as supplemental safety rules. Participants should always follow all necessary OSHA guidelines.

1. USE this unit as a source of supplemental safety training in basic practices in materials handling

2. ORDER or OBTAIN supplemental training materials for your presentation

   a. Films and videotape

      (1) Safety On the Job Series: Preventing Back Injuries. Color, 24 minutes, VHS. Available from AIMS Media, 6901 Woodley Avenue, Van Nuys, CA 91406-4878, or toll-free at (800) 367-2467

   b. Written materials

      (1) 29 CFR 1910 of the OSHA General Industry Safety and Health Standards -- Selected sections as needed

      (2) Accident Prevention Manual for Industrial Operations--Engineering and Technology (Current Edition), from the National Safety Council

      For current catalog, write or call the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois 60611 or 1-800-621-7619; or contact the Oklahoma Safety Council, P.O. Box 14686, Oklahoma City, Oklahoma 73113 or (405) 848-8626

      (3) Best's Safety Directory (Current Edition), from the A.M. Best Company, Ambest Road, Oldwick, New Jersey 08858 or (201) 439-2200

      (4) Drive Your Fork Truck the Way the Pros Do (booklet), from the National Safety Council

      See the address and phone number listed under (2)

      (5) Safety posters, available from the National Safety Council in their Poster Directory (Current Edition)

      See the address and phone number listed under (2)

   c. Chalkboard, flip chart, chalk, marking pens, etc.

INSTRUCTOR'S GUIDELINES

3. EXPLAIN or REVIEW your company's safety policies or guidelines for handling each type of material, as you discuss each type of material and the ways it should be handled

INSTRUCTOR'S GUIDELINES

Factors that Contribute to Injuries

1. EXPLAIN that many factors can lead to injuries on the job, either (a) in combination or (b) by themselves

   HINT: Also discuss the possible long-term consequences of following unsafe practices on the job, i.e., many injuries may not appear until years later.

2. GIVE examples of the factors that exist at your job site (and in specific work areas, if possible)

   HINT: Ask participants if they have noticed these factors on the job. For example, have they had problems with materials because of the material's size, weight, or shape; because of obstructions, etc?

3. ASK participants how they would limit each factor to help prevent an accident or injury

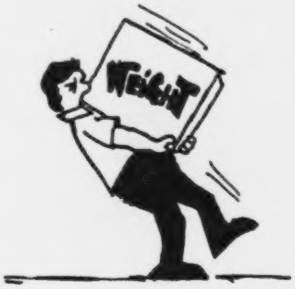
4. DISCUSS your company's guidelines or policies about handling materials

   HINT: Refer to these guidelines or policies as you discuss each section of this unit.

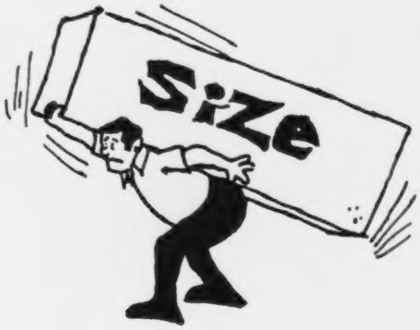
MATERIALS HANDLING

FACTORS THAT CONTRIBUTE TO INJURIES*

Weight -- Overestimating your own physical abilities and lifting objects that are heavier than you can handle



Size -- Moving an object that may be within your physical ability to move, but that is too long, too high, or too wide to move safely



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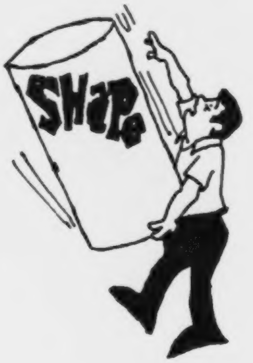
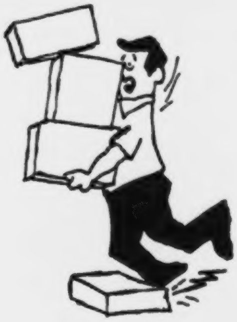
MATERIALS HANDLING

FACTORS THAT CONTRIBUTE TO INJURIES

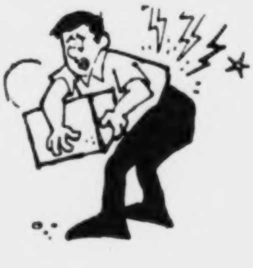
Shape -- Moving an object that is within your physical ability to move, but that has an odd shape that makes safe lifting or moving difficult



Obstructions -- Stacking materials so high that your vision is limited or completely obstructed while moving the materials



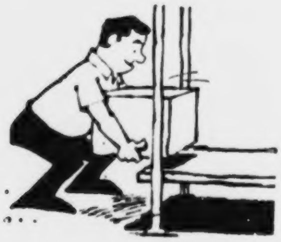
Improper position -- Twisting or turning into an awkward position while lifting



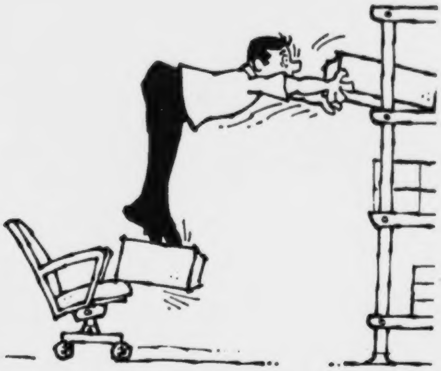
MATERIALS HANDLING

FACTORS THAT CONTRIBUTE TO INJURIES

Improper storage -- Storing heavy objects on a floor so that lifting the objects results in strain. Heavy objects should be at least 12 inches off the floor



Improper reaching -- Using chairs, boxes, or other objects for reaching items, instead of using a ladder



INSTRUCTOR'S GUIDELINES

Steps for Safe Lifting

1. STATE that these steps should be followed each time participants perform any lifting

   HINT: Explain how each step helps to limit the factors that contribute to injuries.

2. ENCOURAGE participants to learn the basic steps in order

   HINT: To make it easier for participants to learn the steps, you could emphasize the verbs in capital letters that are the first words in each step.

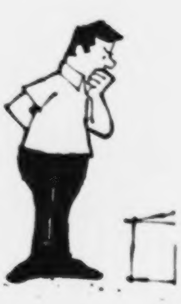
3. DISCUSS each of the steps

Step 1	Explain that participants should get help for lifting, if they decide that the load is not safe to lift alone (do participants know their own limits?) Describe how poor size-up of the load can lead to injury (give examples of situations) Discuss the limits followed by your company
Step 2	Show that knees must be bent and the back must be straight -- lifting is safely done with the legs, not the back Show a secure grip (on different objects, if possible) Explain how failing to follow any step could lead to injury (give examples of situations)
Step 3	Emphasize this rule Describe how turning at the waist puts strain on the back **HINT:** Watch the video Safety On the Job Series: Preventing Back Injuries (from AIMS Media) yourself before your presentation, to help you describe this back strain.
Step 4	Ask what could happen if the path is not clear
Step 5	Show that leg muscles should do the job, not back muscles Explain the NOTE -- for better grip, less strain, etc

MATERIALS HANDLING

STEPS FOR SAFE LIFTING*

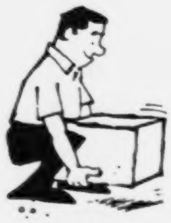
1. SIZE UP the load to be sure you can handle it alone, then place your feet close to the object and about 12 inches apart

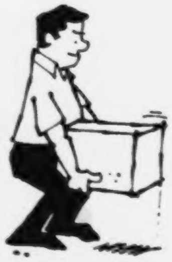


CAUTION: KNOW YOUR LIMITS FOR SAFE LIFTING. GET HELP IF NEEDED.

2. BEND your knees, grip the object securely, then lift the load straight up, pushing with your legs, keeping your back straight, and keeping the load close to your body

   NOTE: Wear appropriate gloves if necessary for a secure grip, and safety shoes with steel toes.





*Adapted with permission from Sheet Metal Basics, Mid-America Vocational Curriculum Consortium, Inc. Copyright 1983.

INSTRUCTOR'S GUIDELINES

4. DEMONSTRATE each step for safe lifting

   HINT: Use empty boxes or other empty containers for your demonstration.

5. ASK participants to demonstrate the basic steps for safe lifting

   HINT: Have other participants review each demonstration. Can they recognize safe and unsafe lifting?

6. DEMONSTRATE the steps for team lifting

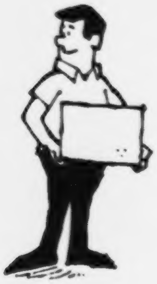
   HINT: Explain that the basic steps for safe lifting also apply for team lifting.

MATERIALS HANDLING

STEPS FOR SAFE LIFTING

3. TURN with your feet to turn your body after lifting the load into a carrying position

   NOTE: Turn with your feet. Do not twist at the waist.

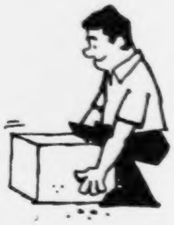


4. CHECK your path of travel to be sure it is clear of people and objects

   NOTE: Plan your job in advance and know your path of travel.

5. LOWER the load by bending your knees

   NOTE: Store heavy objects at least 12 inches off the floor.



MATERIALS HANDLING

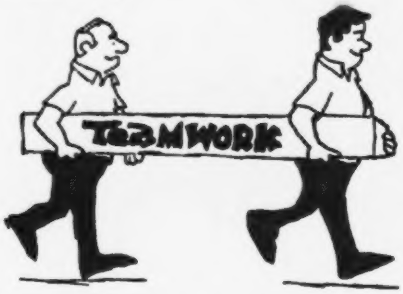
STEPS FOR SAFE LIFTING

Team Lifting

1. STAY CLOSE to the load

2. DISTRIBUTE the load equally

   For Long Objects -- Carry long objects at the same level and on the same side of the body



3. GIVE directions while lifting and moving

   NOTE: Plan your job and path of travel before you lift.

4. WATCH OUT for the other lifter (if one of you must walk backwards)

5. SET DOWN the load in the reverse order of lifting the load

INSTRUCTOR'S GUIDELINES

Moving Materials by Hand

1. STATE that these are General Safety Rules that apply to moving many different materials by hand

   HINT: Explain that participants should follow these rules in addition to the safety rules for specific materials.

2. DISCUSS each of the General Safety Rules

Rule 1	Ask participants about the hazards that could lead to accidents or injuries, hazards that could be prevented by advance planning (or give examples yourself)
Rule 2	Ask participants how to handle materials in other ways, then give examples of the means available at your job site **EXAMPLE:** Handtrucks, pallet-jacks, powered industrial trucks, etc.
Rule 3	Show examples of personal protective equipment needed when moving different materials Describe situations and hazards that show the need for personal protective equipment
Rule 4	Emphasize this rule
Rule 5	Give examples of unsafe surfaces (because they are not clean) Explain the importance of keeping hands clean, too
Rule 6	Give examples of safe and unsafe footing Emphasize the NOTE
Rule 7	Refer to Rule 5
Rule 8	Discuss the possible hazards of these areas Explain the NOTE -- Participants should get help to lift any load above their heads

MATERIALS HANDLING

MOVING MATERIALS BY HAND

1. PLAN the move

   NOTE: Know what you must lift, how you will lift it, and where you will move it.

2. LIMIT the need to handle materials by hand

   NOTE: You could combine or eliminate operations, or use mechanical devices for handling materials.

3. WEAR the appropriate types of personal protective equipment for the job -- gloves, safety shoes with guards, eye and face protection, respirators, etc

   CAUTION: AVOID WEARING GLOVES AROUND MOVING OR REVOLVING MACHINERY, AND KEEP HANDS AND LOOSE CLOTHING AWAY.

4. INSPECT materials before handling for slivers, sharp or jagged edges, rough or slippery surfaces, etc

   NOTE: The surface could injure you or cause the load to slip.

5. CLEAN the surface before lifting an object

6. SECURE your footing before lifting

   NOTE: Remember to turn with your feet, not at your waist.

7. GRIP the object firmly (if handling by hand)

   NOTE: Keep your hands clean of oil and grease.

8. KEEP your fingers away from pinch points, shear points, and other dangerous areas, especially when setting down objects

   NOTE: You may need help to set a load down to a higher position, because your arm muscles are weaker than your leg muscles.

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INSTRUCTOR'S GUIDELINES

Handling Unusual Shapes -- Boxes and Cartons

1. REFER to any applicable OSHA and/or company requirements

2. DISCUSS each of the General Safety Rules

Rule 1 Ask participants why these items are dangerous

Rule 2 Demonstrate this rule, if possible

Rule 3 Demonstrate this rule, if possible

Handling Unusual Shapes -- Barrels and Drums

1. REFER to any applicable OSHA and/or company requirements

2. DISCUSS each of the General Safety Rules

Rule 1 Describe how to determine if barrels or drums are full before moving them

Emphasize the NOTE

Rule 2 Explain the methods used at your job site for moving barrels and drums

Explain the NOTE -- Demonstrate with an empty barrel or drum, if possible

Rule 3 Show how this is done (without a barrel or drum)

Explain the NOTE

Rule 4 Emphasize this rule

Describe what could happen if you move a drum or barrel too quickly or lose control of the container

Rule 5 Describe how this technique can make the container easier to control

Rule 6 Emphasize the CAUTION -- Explain what could happen

MATERIALS HANDLING

HANDLING UNUSUAL SHAPES

Boxes and Cartons

1. CHECK the box or carton for any wire, nails, or other possible hazards before handling
2. GRIP the alternate top and bottom corners when lifting
3. POINT one free corner toward your body or between your legs

Barrels and Drums

1. KNOW whether the barrel or drum is empty or full before moving it

   NOTE: Get help before moving heavy or full drums and barrels, or if the container is filled with a hazardous material.

2. LIFT the container with a commercially-available drum tilter or dolly

   OR

   ROLL barrels and drums on their side if possible without spilling the contents of the container

   NOTE: Two persons can move a drum while it is in an upright position.

3. PUSH rolling drums and barrels against the sides with your hands

   NOTE: To change direction, you should grip the chime of the container. Do not kick the drum or barrel.

4. CONTROL the movement of the container and its contents

   NOTE: Move the drum or barrel slowly.

5. SLIDE drums or barrels down inclines end-first

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INSTRUCTOR'S GUIDELINES

Handling Unusual Shapes -- Sacks

1. REFER to any applicable OSHA and/or company requirements

2. DISCUSS each of the General Safety Rules

Rules 1-6 Demonstrate each rule, if possible

Rules 1-6 Demonstrate the sequence, if possible

HANDLING UNUSUAL SHAPES

6. ROLL drums or barrels up an incline using two or more persons -- stand at either end of the container to control its roll

   CAUTION: DO NOT STAND BELOW THE DRUM OR BARREL WHEN ROLLING IT UP AN INCLINE.

Sacks

1. GRIP sacks at opposite corners
2. STAND erect
3. REST the sack against your hip or belly
4. LIFT the sack onto one shoulder, stooping slightly
5. CARRY the sack so that it rests partly on your shoulder and partly on your back and arm

   NOTE: Your other hand should be holding the sack at the front corner.

6. LOWER the sack with your legs flexed and your back straight

   NOTE: Swing the sack slowly from your shoulder to your hip and belly, then to the ground.

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INSTRUCTOR'S GUIDELINES

Handling Unusual Shapes -- Flat Glass

1. REFER to any applicable OSHA and/or company requirements

2. DISCUSS each of the General Safety Rules

   Rule 1 Show examples of personal protective equipment needed

   Describe situations that show the need for personal protective equipment

   Rule 2 State that glass is heavy and fragile, and must be controlled when being moved

   Ask participants about the hazards that exist

   Rule 3 Describe how this is done

   Rule 4 Describe how this is done

   Rule 5 Demonstrate this rule (without an actual plate of glass)

   Emphasize the CAUTION

   Rule 6 Refer to the importance of advance planning to provide a clear path

Handling Unusual Shapes -- Sheet Metal

1. REFER to any applicable OSHA and/or company requirements

2. DISCUSS each of the General Safety Rules

   Rule 1 Show examples of personal protective equipment needed when handling sheet metal

   Emphasize the CAUTION

   Rule 2 Explain the equipment used at your job site

   Discuss the persons authorized to use the equipment at your job site

   Rule 3 Explain the importance of advance planning when moving sheet metal

   Refer to Rule 1 of the General Safety Rules for Moving Materials by Hand

MATERIALS HANDLING

HANDLING UNUSUAL SHAPES

Flat Glass

1. WEAR gloves or hand laps, leather cuffs and safety sleeves, a leather apron, leggings, and safety shoes with metatarsal guards

2. CARRY one plate of glass at a time (unless the plates are small)

3. LIFT each plate carefully

4. REST the bottom edge of the plate in your palm, palm turned upward

5. HOLD the top edge of the plate with your other hand

   CAUTION: NEVER CARRY GLASS PLATES UNDER YOUR ARMS. A FALL COULD BREAK THE GLASS AND SEVER AN ARTERY.

6. WALK slowly along a clear path

Move larger plates of flat glass using the appropriate handling equipment, or by using two persons if no equipment is available.

Sheet Metal

1. WEAR the appropriate personal protective equipment when moving sheet metal

   EXAMPLES: Leather gloves, hand leathers, or gloves with metal inserts.

   CAUTION: SHEET METAL USUALLY HAS SHARP EDGES. ALWAYS WEAR APPROPRIATE PROTECTIVE EQUIPMENT WHEN HANDLING SHEET METAL BY HAND. FOLLOW ALL OSHA GUIDELINES.

2. HANDLE bundles of sheet metal with power equipment

3. CLEAR your path before moving sheet metal

   NOTE: Sharp edges could cut bystanders.

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INSTRUCTOR'S GUIDELINES

Handling Unusual Shapes -- Cylinders (Compressed Gas)

1. REFER to any applicable OSHA and/or company requirements

2. DISCUSS each of the General Safety Rules

   Rules 1-5 Explain why each rule is important

   NOTE: Discuss the policies and guidelines followed at your job site for handling cylinders (as those policies and guidelines apply to each rule)

MATERIALS HANDLING

HANDLING UNUSUAL SHAPES

NOTE: Follow all OSHA guidelines.

Cylinders (Compressed Gas)*

1. KEEP caps on and valves closed on all cylinders not in use
2. DO NOT LIFT a cylinder by its cap at any time
3. DO NOT APPLY oil or grease to a cylinder fitting
4. DO NOT ROLL a cylinder horizontally across a floor

   NOTE: Never use a cylinder as a roller or to support something else.

5. DO NOT DROP a cylinder or handle cylinders roughly

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*Adapted with permission from Introduction to Welding, Mid-America Vocational Curriculum Consortium, Inc. Copyright 1984.

INSTRUCTOR'S GUIDELINES

Common Hazards

1. DISCUSS the common hazards of handtrucks

   HINT: Ask participants how often they have experienced these hazards on the job.

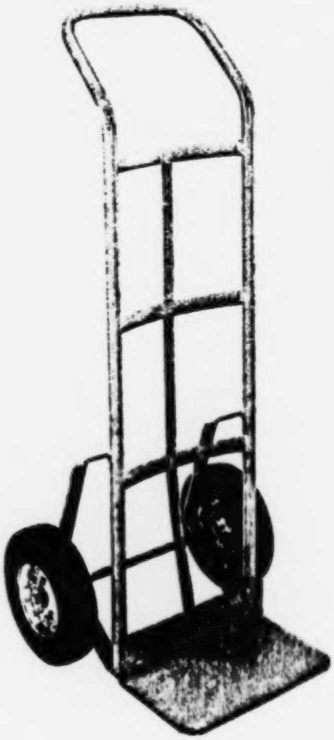
2. POINT OUT the areas on a handtruck where injuries are likely to occur

MATERIALS HANDLING

HANDTRUCKS

Common Hazards

Handles -- Jamming your hands against door frames, walls, stock, etc



Wheels -- Crushing your feet by pulling the truck, instead of pushing it; running off raised surfaces

Tongue -- Damaging stock by improper placement of tongue under the load; hitting other persons with the tongue; stepping on the tongue when the truck is improperly left in a horizontal position

INSTRUCTOR'S GUIDELINES

General Safety Rules -- Two-Wheeled Trucks

Rule 1	Explain how heavy objects on top could *tip* or *crush* the objects below State that a properly-loaded handtruck is easier to move and control
Rule 2	Explain how this rule helps prevent damage to the load and will help ensure proper balance of the load on the truck
Rule 3	Emphasize this rule for properly balancing the load on the handtruck
Rule 4	Give examples of common unsafe situations and ways to correct them
Rule 5	Explain why this rule is important (refer back to the common hazards)
Rule 6	Show or explain how to secure different loads
Rule 7	Explain that the truck is made to carry the load, not to put added strain on the user
Rule 8	Explain or show how a heavy load on the handles will put added strain on the user's arms Discuss the possible loss of control that could result
Rule 9	Emphasize the NOTE
Rule 10	Give examples of different hazards that exist if these guidelines are not followed (what injuries or accidents could result?)
Rule 11	List the designated storage areas for handtrucks at your job site Explain that handtrucks must never be left in a horizontal position on the floor

MATERIALS HANDLING

HANDTRUCKS

General Safety Rules

Two-Wheeled Trucks

1. KEEP a low center of gravity for the load

   NOTE: Place heavy objects beneath lighter objects.

2. TIP the load forward slightly so that the tongue of the truck can slide under the load

3. PUSH the truck completely under the load

   NOTE: The tongue should be completely covered.

4. PLACE the load so that it will not slip, shift, or fall

   NOTE: Strap or chain bulky items to the truck.

5. LOAD the truck to a height that allows a clear view of the path ahead

6. SECURE the load before moving it

7. BALANCE and PUSH the load

   NOTE: Let the truck carry the load.

8. CARRY the weight of the load on the axles, not on the handles

9. FACE forward at all times

   NOTE: You must be able to see the truck and the objects in its path at all times.

10. CONTROL the truck

    NOTE: Move at a safe speed, hold both handles at all times, and make wide turns to help keep the load from shifting.

11. STORE the truck in a designated area after use

INSTRUCTOR'S GUIDELINES

General Safety Rules -- Four-Wheeled Trucks

Rule 1	Describe even and uneven loads
Rule 2	Emphasize the NOTE
Rule 3	Show or explain how to secure different loads
Rule 4	Describe how this guideline increases control over the load and decreases the strain on the user
Rule 5	Give examples of different hazards that exist if these guidelines are not followed (what injuries or accidents could result?)
	Emphasize the CAUTION
Rule 6	List the designated storage areas at your job site
	Describe situations where handtrucks create tripping hazards or block traffic (and give solutions)

MATERIALS HANDLING

HANDTRUCKS

General Safety Rules

Four-Wheeled Trucks

1. LOAD the truck evenly to prevent tipping the load

2. LOAD the truck to a height that allows a clear view of the path ahead

   NOTE: If the four-wheeled truck has high racks for loading, then get help to move the truck when loaded -- one person guiding the front and one person guiding the back.

3. SECURE the load before moving it

4. PUSH all four-wheeled trucks (unless the truck has a fifth wheel and a handle for pulling)

5. CONTROL the truck

   NOTE: Move at a safe speed, hold both handles at all times, and make wide turns to help keep the load from shifting.

   CAUTION: BE ESPECIALLY CAREFUL AT BLIND CORNERS AND WHEN APPROACHING DOORWAYS.

6. STORE unloaded trucks in a designated area when not in use

   NOTE: Do not allow handtrucks to create a tripping hazard or block traffic.

INSTRUCTOR'S GUIDELINES

Powered Industrial Trucks -- General Safety Rules

1. EXPLAIN your company's policies or guidelines for using powered industrial trucks

2. DISCUSS each of the General Safety Rules

Rule 1 List the kinds of trucks used at your job site and the uses of each

Give examples of unsafe situations resulting from improper use of a truck (ask participants why a particular use is not safe for a given truck)

Rule 2 List the safety devices that should be checked

State the service points required and explain your company's service schedule (if applicable)

Rule 3 Explain that a safe speed is a combination of a through d

Give examples of poor surface conditions

Ask participants for examples of hazards from driving at an unsafe speed

Rule 4 Give examples of transport routes that could be followed, then show the shortest possible safe work cycle

HINT: A "work cycle" means safely moving a load from one place to another.

Explain how the hazards could increase when a longer work cycle is followed

Rule 5 Explain why this rule is important

Rule 6 List possible danger areas at your job site that apply to this rule

Rule 7 Discuss this rule in terms of protecting other persons and protecting the load

Give examples of rough surfaces at your job site

Rule 8 Describe possible unsafe situations and the accidents or injuries that could result

Rule 9 Explain the responsibility of drivers

MATERIALS HANDLING

POWERED INDUSTRIAL TRUCKS

General Safety Rules

NOTE: Follow all OSHA guidelines.

1. USE all trucks for their intended purposes only

   NOTE: Do not operate any powered industrial truck without completing all required training for that truck.

2. CHECK all safety devices before using the truck

   NOTE: Service all powered industrial trucks regularly.

3. DRIVE at a safe speed

   a. The posted speed limit in any given area,

   b. The speed at which you can stop the truck safely within a clear fixed distance ahead of you,

   c. The speed at which you can safely turn with the load, and

   d. The safe speed for surface conditions

4. FACE the direction of travel at all times

   NOTE: Follow the shortest possible safe work cycle and keep the transport distance as short as possible.

5. STOP at all blind corners and before passing doorways

   NOTE: Carry loads high enough to clear obstacles and low enough to see your travel path clearly.

6. CONTROL the truck on turns, grades, and inclines

   CAUTION: QUICK STARTS AND STOPS, AND SHARP TURNS, CAN CAUSE THE LOAD TO SHIFT DANGEROUSLY.

7. DRIVE slowly and carefully over rough surfaces

8. KEEP your body inside the guarded operating area of the truck at all times

   NOTE: You could pinch or crush your arms and legs between the truck and a wall or a stack of material.

9. WATCH for people

INSTRUCTOR'S GUIDELINES

Powered Industrial Trucks -- Some "Do Not" Guidelines

1. EXPLAIN the hazards that could exist if each guideline is not followed

2. DISCUSS your company's policies or guidelines relating to each numbered guideline (and others that you may have)

MATERIALS HANDLING

POWERED INDUSTRIAL TRUCKS

Some "Do Not" Guidelines

NOTE: Follow all OSHA guidelines.

1. DON'T MISUSE a truck by bumping skids, pushing materials, hoisting objects with forklifts, moving or towing other vehicles, or otherwise using a powered industrial truck for purposes for which it was not designed

2. DON'T DRIVE or allow others to drive a powered industrial truck of any kind unless properly trained and authorized

3. DON'T ALLOW other workers to ride on any powered truck

4. DON'T LEAVE a running truck unattended

5. DON'T PARK a truck in any aisle, doorway, or other location where the truck obstructs materials, equipment, or the movement of employees

INSTRUCTOR'S GUIDELINES

Powered Industrial Trucks -- Some Guidelines for Loading Powered Industrial Trucks

1. REFER to any applicable OSHA and/or company requirements

2. DISCUSS each of the General Safety Rules

Rule 1 Explain why this rule is important

Rule 2 Emphasize the CAUTION

Rule 3 Refer to Typical Patterns for Loading Pallets

Show examples of stacking requirements, often marked on boxes and other containers

Explain your company's policies or guidelines for stacking

Rule 4 Give examples of unusual shapes and ways of securing them

Rule 5 Explain why this is important for controlling the load

Rule 6 Give examples of the "safe height" for different materials

EXAMPLE: Your company's height requirements, product manufacturer's suggested stacking limits, obstructions that affect stacking height, etc.

Emphasize the NOTE

MATERIALS HANDLING

POWERED INDUSTRIAL TRUCKS

Some Guidelines for Loading Powered Industrial Trucks

1. SECURE all trucks and trailers properly before loading and unloading

2. DISTRIBUTE the load evenly

   CAUTION: AN UNSTABLE LOAD COULD SHIFT DANGEROUSLY OR FALL.

3. STACK and SECURE materials neatly on pallets

   NOTE: Follow any requirements for stacking specific materials, such as height limits, stacking patterns, etc.

4. LOAD objects with unusual shapes so that they cannot roll or fall when moved

   NOTE: Block-off or tie round objects so that they cannot roll.

5. PLACE heavy objects with the weight as low as possible

6. DO NOT LOAD beyond the safe height for the material

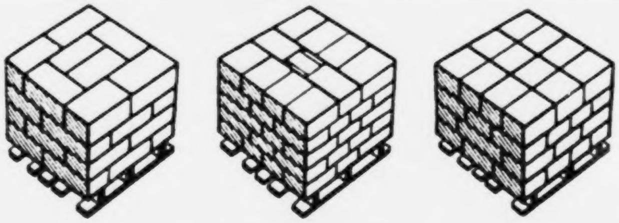
   NOTE: Raise the top pallet in a stack when loading or unloading, to keep it from catching on the lower pallets.

MATERIALS HANDLING

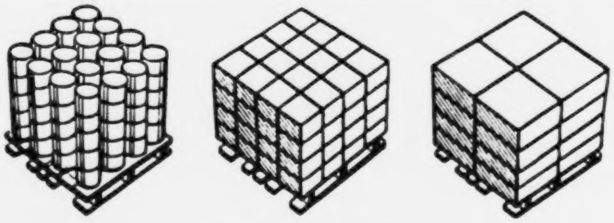
POWERED INDUSTRIAL TRUCKS

Some Guidelines for Loading
Powered Industrial Trucks

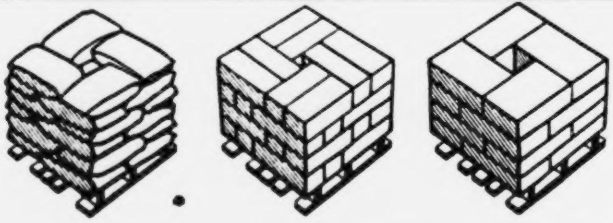
Typical Patterns for Loading Pallets



BRICK PATTERN



BLOCK PATTERN



PINWHEEL PATTERN

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INSTRUCTOR'S GUIDELINES

Storing Materials

1. DISCUSS the General Safety Rules for each kind of material

   HINT: You could also add rules for other kinds of materials at your job site that are not included in this section.

2. DESCRIBE any special considerations for storing different materials

   EXAMPLE: Why are pipes and bars stored differently than barrels and drums? What special hazards exist for each material?

3. IDENTIFY all storage areas for each material at your job site

   HINT: Also identify methods of storing that must be followed at your job site, such as on storage racks, pallets, upright or horizontal, etc.

4. SHOW examples of any personal protective equipment needed when storing materials (such as sheet metal)

5. EXPLAIN any recommended height limits

6. DISCUSS the guidelines for storing each kind of material in terms of protecting other workers and protecting the load

MATERIALS HANDLING

STORING MATERIALS

Wire-Bound and Box Bins

1. PLACE wire-bound bins so that the sharp ends do not stick out into aisles

2. TIE-OFF stacks of wire-bound and box bins to keep them from falling

   NOTE: Do not exceed recommended height limits.

3. STACK bins safely

   NOTE: Stack bins lower near walkways, and do not stack full bins on top of empty bins.

4. STORE bins on skids for easy handling

Cardboard Cartons

1. STORE loaded cartons on platforms above the floor to protect the cartons against moisture or other damage

   NOTE: Wet stacks of cardboard will collapse.

2. STACK cartons safely (See the "Height Factors" below)

   NOTE: Do not stack full cartons on top of empty cartons, and follow the recommended height limits marked on many cartons.

   Height Factors

   - Type of material in a carton

   - Support limit of sides of a carton

   - Pattern of the stack of loaded cartons

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STORING MATERIALS

Barrels

1. STACK barrels in the shape of a pyramid, if possible
2. BLOCK the bottom row to prevent the containers from rolling
3. PLACE planks between rows of barrels stacked end-on-end
4. USE racks to stack barrels on their sides other than in pyramid form,

   OR

   SET planks between rows of containers and block both ends of each row

Drums

1. STORE all filled drums in a designated storage area

   NOTE: You should keep the smallest amount of liquid needed for the job at the actual location where the liquid is used.

2. STACK filled drums on racks

   NOTE: Be sure that all openings on filled drums are tightly sealed before tilting any drum.

3. ISOLATE any drums filled with hazardous or flammable liquids from the rest of the storage area
4. KEEP drums off the floor

   NOTE: This can reduce the risk of puncturing drums with a forklift or other sharp object.

5. ALLOW plenty of space around drums in storage areas

   NOTE: Allow enough space to safely move drums with forklifts and other powered industrial trucks.

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STORING MATERIALS

Bagged Materials

1. CROSS-TIE all bagged material
2. PACK bagged material with the mouths of the bags facing the inside of the stack
3. STACK piles of bags neatly -- avoid overhanging bags

   NOTE: Overhanging bags can rip and spill.

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MATERIALS HANDLING

STORING MATERIALS

Cylinders (Compressed Gas)

1. STORE cylinders away from excessive heat

   CAUTION: STORE FLAMMABLE SUBSTANCES APART FROM CYLINDERS OF COMPRESSED GAS.

2. KEEP cylinders

   a. Upright
   b. Safe
   c. Dry
   d. In a well-ventilated area

3. CHAIN cylinders together in an upright position

   NOTE: Store empty cylinders apart from full ones.

4. PLACE cylinders out of the way

   NOTE: Keep cylinders away from areas where they can be knocked over or damaged.

5. ISOLATE all cylinders from any sources of ignition

6. PROTECT stored cylinders from damage or falling due to passing or falling objects

7. SHIELD all outdoor cylinders from contact with the ground and against extremes of weather

8. USE all safety devices in valves or on cylinders

   NOTE: If you do not know how to safely handle any cylinder or its contents, check the supplier of the gas.

9. FOLLOW all OSHA guidelines for specific kinds of compressed gases

MATERIALS HANDLING

STORING MATERIALS

Pipes and Bars

1. CHOOSE a floor area that can support the load

   NOTE: Pipes and bars place a heavy load on floors.

2. PILE all pipes and bars (and other round materials) in layers separated by strips of wood or iron

   NOTE: Strips should have blocks at one end, or the end should be turned up. Steel bars may require racks with special rollers.

3. LOCATE racks of stored pipe and bars away from aisles

   NOTE: Pipes and bars are dangerous when they are being removed from storage racks.

4. DO NOT DROP pipes or bars onto storage racks -- they could roll or slide

   CAUTION: DO NOT TRY TO STOP ROLLING OR SLIDING PIPES OR BARS WITH YOUR HANDS OR FEET.

5. INCLINE storage racks toward the back, so that pipes cannot roll out

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MATERIALS HANDLING

STORING MATERIALS

CAUTION: MOST SHEET METAL HAS SHARP EDGES.

Sheet Metal

1. WEAR the proper leather gloves, hand leathers, or gloves with metal inserts

   NOTE: Follow all OSHA guidelines for personal protective equipment.

2. HANDLE large amounts in bundles with the right type of power equipment

3. SEPARATE bundles of sheet metal with strips of wood

   NOTE: This will make handling easier, and reduce the chance of the bundles shifting or sliding.

4. BAND all tin plate strip stock after shearing

   NOTE: Use the proper cutting tools to remove the metal bands when needed. Do not allow the ends of bands to stick out into aisles or where they could cut someone.

5. PLACE wooden or metal stakes around pallets and stock tables that hold the load

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INSTRUCTOR'S GUIDELINES

Rigging -- General Safety Rules

1. EXPLAIN how rigging is used at your job site

2. REFER to 29 CFR 1910.184 for specific guidelines

   HINT: Explain OSHA guidelines as requirements, not recommendations.

3. DISCUSS each of the General Safety Rules

   HINT: Also discuss the complete list of safety rules in 29 CFR 1910.184(c).

Rule 1 Show examples of personal protective equipment needed

Describe situations that show the need for personal protective equipment with rigging

Rule 2 Emphasize the importance of inspecting equipment before each use

Rule 3 Refer to 29 CFR 1910.184 for the standards that apply to the equipment used at your job site

HINT: Make transparencies or handouts of the tables or guidelines in 29 CFR 1910.184 that apply.

Rule 4 Discuss the dangers of an unstable load

HINT: Ask participants to identify possible dangers.

Rule 5 Give examples of properly-balanced loads

Rule 6 Emphasize the NOTE

Rule 7 Discuss the obvious and the hidden dangers

Rule 8 List possible hazards from sharp corners, edges, and ends

Rule 9 Emphasize the NOTE

Rule 10 Explain the importance of a solid footing

Rule 11 Describe or show how to block different loads

Emphasize the NOTE

MATERIALS HANDLING

RIGGING

General Safety Rules

NOTE: This list is not complete. Follow all OSHA guidelines for safe operating practices.

1. USE the appropriate personal protective equipment

   NOTE: Follow all OSHA guidelines.

2. INSPECT all rigging equipment before each use

   NOTE: Follow all OSHA guidelines.

3. OBSERVE all rated capacities, safe operating temperatures, and other requirements for slings

   NOTE: Follow all OSHA guidelines.

4. GUIDE and/or STEADY the load with tagline

   NOTE: Be sure that enough people are holding the tagline for heavy loads! Secure all unused lines.

5. BALANCE the load properly

6. CENTER the rigging over the load before lifting

   NOTE: This can help prevent the load from swinging dangerously when lifted.

7. DO NOT WALK under any load

8. BLUNT all sharp corners, edges, and ends

9. USE safety snaps on all hooks

   NOTE: Do not wrap a rope around a hook or secure a wire rope with knots.

10. PLACE outriggers and/or stabilizers on a solid footing

11. BLOCK all loads properly before removing ropes and taglines

    NOTE: Stand clear when slings are heaved from under a load.

INSTRUCTOR'S GUIDELINES

Rigging -- Characteristics of Ropes

1. DISCUSS each type of material and its characteristics
2. GIVE examples of how and where each type of material is used at your job site

MATERIALS HANDLING

RIGGING

Characteristics of Ropes

Material	Characteristics
NATURAL FIBERS	
Manila	Strong and durable Dependable, stands up under severe use and weathering
Sisal	Less durable and lower in strength than manila Used where requirements are less demanding and where low cost is a major factor
SYNTHETICS	
Nylon	Very strong -- about twice the strength of manila Resists abrasion very well; resists weathering High degree of stretch
Terylene	Similar to nylon -- lower in tensile strength and stretch
Polypropylene	Very light -- floats on water Resists rotting Degree of stretch similar to terylene; less strength than nylon
Polyethylene	Strength similar to polypropylene and has a high stretch factor Resists mildew, decay, acids, alkalies

INSTRUCTOR'S GUIDELINES

Rigging -- Principles of Sling Angles

1. EXPLAIN each principle

2. DISCUSS the affect of the angle of the leg on the lifting capacity of a sling leg

MATERIALS HANDLING

RIGGING

Principles of Sling Angles

PRINCIPLE -- As the angle of a sling leg changes, the stress on the sling leg may increase

PRINCIPLE -- Reducing the angle of a sling leg reduces the lifting capacity of the sling

Angle of Single Leg	Lifting Capacity*
60 degrees	87 percent
45 degrees	71 percent
30 degrees	50 percent

*Compared to the lifting capacity of a vertical leg

INSTRUCTOR'S GUIDELINES

Rigging -- Inspecting Slings, Fastenings, and Attachments

1. REFER to 29 CFR 1910.184 for complete guidelines

2. DISCUSS the points of inspection for each type of sling

3. EXPLAIN the reasons for removing a sling from service

   HINT: Ask for and explain the dangers of using slings that should be removed from service. What does each reason tell you about the condition and safety of the sling?

MATERIALS HANDLING

RIGGING

Inspecting Slings, Fastenings, and Attachments

Alloy Steel Chain Slings

1. INSPECT on a regular basis, depending on

   a. Frequency of use
   b. Severity of service conditions
   c. Nature of lifts being made
   d. Service life of the sling, based on your experience

2. REMOVE from service if you find

   a. Wear
   b. Defective welds
   c. Defects (general)
   d. Increase in length

Natural and Synthetic Fiber Rope Slings

REMOVE from service if you find

a. Abnormal wear
b. Powdered fiber between strands
c. Broken or cut fibers
d. Differences in the size or roundness of strands
e. Discoloration or rotting
f. Distortion of the sling hardware

Synthetic Web Slings

REMOVE from service if you find

a. Acid or caustic burns
b. Melting or charring of the sling surface
c. Snags, punctures, tears, or cuts
d. Broken or worn stitches
e. Distortion of fittings

Adapted from 29 CFR 1910.184.

Inspecting Slings, Fastenings, and Attachments

Metal Mesh Slings

REMOVE from service if you find*

a. Broken welds or a broken brazed joint along the sling edge

b. Reduction in the wire diameter of 25% due to abrasion or 15% due to corrosion

c. Lack of flexibility because of fabric distortion

d. Distortion of the female handle so that the depth of the slot is increased more than 10%

e. Distortion of either handle so that the width of the eye is decreased more than 10%

f. Reduction of an original cross-sectional area of the metal at any point around the handle eye

g. Distortion of either handle out of its place

---

*Adapted from 29 CFR 1910.184.

INSTRUCTOR'S GUIDELINES

Scaffolds

1. REFER to 29 CFR 1910.28 for complete guidelines

   HINT: Discuss the OSHA guidelines that apply to the kinds of scaffolds used at your job site.

2. ASK participants to identify hazards with scaffolds

3. DISCUSS each of the General Safety Rules

Rule 1	Show examples of good quality scaffold materials Explain how poor quality materials can affect the safety of a scaffold
Rule 2	Discuss the applicable grading rules Describe common defects in lumber that reduce the strength of the lumber (points of inspection)
Rule 3	Discuss the importance of a solid footing for scaffolds
Rule 4	Show how to fasten scaffold sections together correctly, according to the types of scaffolds used at your job site, the manufacturer's instructions, and OSHA guidelines
Rule 5	Refer to 29 CFR 1910.28
Rule 6	Know the applicable working loads
Rule 7	Ask for examples of hazards that could exist if a scaffold is moved while it is being used
Rule 8	Outline the approved access areas and the access areas that are not allowed (unsafe)
Rule 9	Give or ask for examples of overhead hazards and methods for protecting against overhead hazards
Rule 10	Describe unsafe situations on a scaffold resulting from poor storage of tools and other materials Explain how poor storage of tools, materials, and waste materials creates dangerous situations for persons on the scaffold and persons around the scaffold
Rule 11	Describe unsafe weather conditions and their effects on scaffold safety

SCAFFOLDS

NOTE: Follow all OSHA guidelines.

1. INSPECT all scaffold materials before building

   NOTE: Do not use any worn, rusted, or otherwise damaged equipment.

2. USE only scaffold planking that is Scaffold Grade

   NOTE: Follow the grading rules for the species of wood used.

3. LOCATE scaffolds on a solid footing

   CAUTION: NEVER USE UNSTABLE OBJECTS TO SUPPORT SCAFFOLDS OR PLANKS.

4. BRACE all scaffold poles, legs, and uprights securely and plumb

   NOTE: Fasten the braces correctly. Never force a brace to fit.

5. INSTALL all required toeboards and guardrails

6. LOAD scaffolds not above the working load for which they are intended

7. DO NOT CHANGE or MOVE scaffolds while they are in-use or occupied

8. CLIMB scaffolds by the access ladder or other approved safe access

9. PROTECT against overhead hazards while working on scaffolds

10. STORE all tools, materials, and waste materials safely

    NOTE: These materials should not be allowed to create a hazard on the scaffold.

11. DO NOT WORK on scaffolds during unsafe weather conditions

MATERIALS HANDLING
SELF-TEST 1

1. After sizing up the load, you should place your feet close to the object and about

    a. 10 inches apart
    b. 12 inches apart
    c. 14 inches apart
    d. 16 inches apart

2. After lifting the load into a carrying position, you should turn

    a. with your feet
    b. by twisting at the waist
    c. only if the load is heavy
    d. only if the load is light

3. Check your path of travel to be sure it is clear

    a. of people
    b. of objects
    c. both (a) and (b)
    d. none of the above

4. Lower the load by

    a. bending your waist
    b. bending your knees
    c. dropping the load
    d. letting the load slip from your hands

MATERIALS HANDLING
SELF-TEST 2

1. Planning the move includes

   a. knowing what you must lift
   b. knowing how you will lift
   c. knowing where you will move
   d. all of the above
   e. none of the above

2. You should always secure your footing

   a. before lifting
   b. when the load starts to slip
   c. when the walking surface is slick
   d. when the load is heavy

Read the paragraph below before answering the questions that follow --

After you finish cutting a number of small pieces of wood, you run out of stock and must find more. While lifting a stack of small boards, you get a sliver in one finger that causes you to drop the load.

3. You should always

   a. inspect materials before handling
   b. inspect materials if the load looks dangerous
   c. inspect materials if you have time
   d. inspect materials if an accident occurs

4. You could have protected your hand by

   a. lifting the load more slowly
   b. dragging the boards instead of lifting them
   c. wearing the appropriate types of personal protective equipment for the job
   d. securing your footing before lifting

MATERIALS HANDLING
SELF-TEST 3

1. When handling boxes and cartons, you should grip

   a. the top corners
   b. the bottom corners
   c. the alternate top and bottom corners
   d. the sides of the box or carton

2. You should push rolling drums and barrels against the sides

   a. by gently kicking the drum or barrel
   b. with your hands
   c. with a handtruck
   d. with a powered industrial truck

3. To lower a sack, you should have

   a. your legs straight
   b. your waist bent
   c. your back straight
   d. your legs flexed and your back straight

4. Why should you clear your path before moving sheet metal?

   a. So you can walk faster while carrying the load
   b. So you can drop the load if needed
   c. Because sharp edges could cut bystanders
   d. None of the above

5. When handling flat glass, you should

   a. lift each plate carefully
   b. rest the bottom edge of the plate in your palm, palm turned upward
   c. hold the top edge of the plate with your other hand
   d. walk slowly along a clear path
   e. all of the above

MATERIALS HANDLING
SELF-TEST 3

Read the paragraph below before answering the questions that follow --

As you are leaving the warehouse receiving area, you notice that one of your co-workers is trying to move a drum from below the loading dock to the floor above. A ramp goes from the ground upward to the floor. Your co-worker is trying to roll the drum alone by standing below the drum and rolling it up the ramp. You cannot tell if the drum is full or empty. What advice would you give?

6. You should roll drums or barrels up an incline

    a. using a handtruck only
    b. using two or more persons
    c. only if the drum or barrel is empty
    d. only if no forklift is available

7. Your co-worker is standing in a dangerous place because you know that persons rolling drums or barrels up an incline should control the roll of the container by standing

    a. at either end of the container
    b. at the top of the container
    c. at the top and the bottom of the container
    d. straddling the container

MATERIALS HANDLING
SELF-TEST 4

1. When using a two-wheeled truck, place the load so that it will not

   a. slip
   b. shift
   c. fall
   d. all of the above
   e. none of the above

2. You must be able to see the truck and the objects in its path at all times. This means that you must

   a. face forward at all times
   b. walk backward at all times
   c. walk forward or backward
   d. use a four-wheeled truck only

3. Controlling the truck includes

   a. moving at a safe speed
   b. holding both handles at all times
   c. making wide turns to prevent shifting the load
   d. all of the above
   e. none of the above

4. The weight of the load should be carried

   a. on the handles
   b. on the axles
   c. on the handler of the truck
   d. none of the above

Read the paragraph below before answering the questions that follow --

Two workers are busy unloading a truck containing 800 boxes. One worker is removing the boxes from the truck by hand, while the other worker is stacking the boxes on a handtruck. The second worker is not loading the truck according to any order -- some larger, heavier boxes are stacked on top of smaller, lighter ones. The worker loads the truck until the stacked boxes are just above the worker's line of vision when moving the truck. The worker carefully tilts the loaded truck back, holds one hand on the corner of the highest box, and pulls the handtruck with the other hand.

5. What is wrong with the way that the handtruck is being loaded?

   a. The handtruck will have a low center of gravity
   b. The handtruck will not have a low center of gravity
   c. The handtruck should only be used for light loads
   d. The handtruck should only be used for heavy loads

6. You know that the load is stacked too high. How do you know?

    a. The load is above the worker's line of vision
    b. The load is below the worker's line of vision
    c. The worker must tilt the handtruck back to move it
    d. The worker must pull the handtruck

7. When moving a handtruck, you should

    a. balance and push the load
    b. face forward at all times
    c. control the truck
    d. all of the above
    e. none of the above

MATERIALS HANDLING
SELF-TEST 5

1. To prevent tipping the load on a four-wheeled truck, you should

   a. load the truck as high as possible
   b. load the truck with heavy items on top
   c. load the truck evenly
   d. load the truck as quickly as possible

2. You should secure the load

   a. before moving it
   b. before moving the truck around a corner
   c. before pulling a truck
   d. if the load starts to tip over

3. Controlling the truck means

   a. moving at a safe speed
   b. holding both handles at all times
   c. making wide turns
   d. all of the above
   e. none of the above

4. Which of the following is NOT a general safety rule for using four-wheeled handtrucks?

   a. Load the truck to a height that allows a clear view of the path ahead
   b. Store unloaded trucks in a designated area when not in use
   c. Secure the load before moving it
   d. Pull all four-wheeled trucks
   e. Load the truck evenly to prevent tipping the load

MATERIALS HANDLING
SELF-TEST 6

1. A safe speed for powered industrial trucks means

    a. the posted speed limit in any given area
    b. the speed at which you can stop the truck safely within a clear fixed distance ahead of you
    c. the speed at which you can safely turn with the load
    d. the safe speed for surface conditions
    e. all of the above

2. Pinching or crushing your arms and legs between the truck and a wall or a stack of material is an accident that could be prevented by

    a. facing the direction of travel at all times
    b. driving slowly and carefully over rough surfaces
    c. controlling the truck on turns, grades, and inclines
    d. keeping your body inside the guarded operating area of the truck at all times
    e. none of the above

3. Which of the following is NOT a general safety rule for using powered industrial trucks?

    a. Drive quickly and carefully over rough surfaces
    b. Check all safety devices before using the truck
    c. Stop at all blind corners and before passing doorways
    d. Watch for people

MATERIALS HANDLING
SELF-TEST 7

Read the paragraph below before answering questions (1) and (2) --

A co-worker is using a forklift to move a number of loaded pallets. The pallets are stacked in a pinwheel pattern. After moving two of the pallets, your co-worker stops and leaves the forklift running, while talking to another employee. The forklift has not been starting easily lately, so your co-worker decided to leave it running for just a minute or two. After getting back into the forklift, the co-worker uses the forklift to push aside some 55-gallon drums that are sitting on the floor. The co-worker then finishes the job of moving the pallets.

1. Your co-worker should not have

   a. left a running truck unattended
   b. spoken to another employee while working
   c. left the truck running unattended for longer than one minute
   d. moved a pallet stacked in a pinwheel pattern

2. How is your co-worker misusing the forklift with the 55-gallon drums?

   a. By moving drums with the forklift
   b. By pushing drums with the forklift
   c. By not moving all of the pallets before moving the drums
   d. By pushing the drums aside instead of pushing them to a designated storage area

3. How should you load objects with unusual shapes?

   a. So they cannot roll when moved
   b. So they cannot fall when moved
   c. Both (a) and (b)
   d. None of the above

4. Which of the following is NOT a general guideline for loading powered industrial trucks?

   a. Place heavy objects with the weight as high as possible
   b. Stack and secure materials neatly on pallets
   c. Secure all trucks and trailers properly before loading and unloading
   d. Distribute the load evenly
   e. Do not load beyond the safe height for the material

MATERIALS HANDLING
SELF-TEST 8

1. Which ends of wire-bound bins should not stick out into aisles?
   - a. Upper ends
   - b. Lower ends
   - c. Sharp ends
   - d. Rounded ends

2. The height factors for stacking cartons safely include the
   - a. type of material in a carton
   - b. support limit of sides of a carton
   - c. pattern of the stack of loaded cartons
   - d. all of the above
   - e. none of the above

3. Which of the following is NOT a general guideline for storing barrels?
   - a. Stack barrels in the shape of a pyramid, if possible
   - b. Block the top row to prevent the containers from rolling
   - c. Place planks between rows of barrels stacked end-on-end
   - d. All of the above

4. To reduce the risk of puncturing drums with a forklift or other sharp object, you should
   - a. keep drums off the floor
   - b. push drums that are on the floor
   - c. hoist drums with the forklift
   - d. surround all drums with boxes or empty drums

5. The mouths of all bagged materials should
   - a. be stored open
   - b. face the outside of the stack
   - c. face the inside of the stack
   - d. face upward only

6. Which of the following is NOT a general guideline for storing compressed gas cylinders?
   - a. Store cylinders away from excessive heat
   - b. Chain cylinders together in an upright position
   - c. Isolate all cylinders from any sources of ignition
   - d. Protect stored cylinders from damage or falling due to passing or falling objects
   - e. All of the above

7. Racks of stored pipe and bars should be located

   a. away from aisles
   b. near aisles
   c. so that the rack is inclined toward the front
   d. on any floor surface

8. Which of the following is NOT a general guideline for storing sheet metal?

   a. Band all tin plate strip stock after shearing
   b. Handle sheet metal with your bare hands only
   c. Separate bundles of sheet metal with strips of wood
   d. Handle large amounts in bundles with the right type of power equipment

MATERIALS HANDLING
SELF-TEST 9

1. Which of the following is a natural fiber rope?

    a. Terylene
    b. Sisal
    c. Nylon
    d. Polyethylene

2. A synthetic rope that has about twice the strength of manila rope is

    a. sisal
    b. terylene
    c. polyethylene
    d. nylon

3. A synthetic rope that resists mildew, decay, acids, and alkalies is

    a. nylon
    b. manila
    c. polyethylene
    d. polypropylene

4. A natural fiber rope that is less durable and lower in strength than manila is

    a. sisal
    b. terylene
    c. nylon
    d. polypropylene

MATERIALS HANDLING
SELF-TEST 10

1. Which of the following is NOT a general safety rule for using scaffolds?

   a. Locate scaffolds on a solid footing
   b. Install all required toeboards and guardrails
   c. Force any braces to fit, if needed
   d. Load scaffolds not above the working load for which they are intended

2. Do not change or move scaffolds

   a. while they are in-use
   b. while they are occupied
   c. while they are in-use or occupied
   d. unless you have permission to do so

3. On a scaffold, what should you brace securely and plumb?

   a. All scaffold poles
   b. All scaffold legs
   c. All scaffold uprights
   d. All of the above
   e. None of the above

MATERIALS HANDLING
ANSWERS TO SELF-TESTS

NOTE: Check the appropriate pages in this unit for more information or explanations.

SELF-TEST 1

1. b; 2. a; 3. c; 4. b

SELF-TEST 2

1. d; 2. a; 3. a; 4. c

SELF-TEST 3

1. c; 2. b; 3. d; 4. c; 5. e; 6. b; 7. a

SELF-TEST 4

1. d; 2. a; 3. d; 4. b; 5. b; 6. a; 7. d

SELF-TEST 5

1. c; 2. a; 3. d; 4. d

SELF-TEST 6

1. e; 2. d; 3. a

SELF-TEST 7

1. a; 2. b; 3. c; 4. a

SELF-TEST 8

1. c; 2. d; 3. b; 4. a; 5. c; 6. e; 7. a; 8. b

SELF-TEST 9

1. b; 2. d; 3. c; 4. a

SELF-TEST 10

1. c; 2. c; 3. d

4 4 4 4 4 4 4 4

Hand Tools

Hand Tools

Hand Tools

Hand Tools

Hand Tools

Hand Tools

Hand Tools

Hand Tools

Hand Tools

INSTRUCTOR'S GUIDELINES

OBJECTIVE: The objective of this presentation is to instruct participants in the safe use of common hand tools. Discuss the safety guidelines presented in this unit as supplemental safety rules. Participants should always follow all necessary OSHA guidelines and the tool manufacturer's instructions for proper use and safety.

1. USE this unit as a source of supplemental safety training in hand tools safety

2. ORDER or OBTAIN supplemental training materials for your presentation

    a. Films and videotape

        (1) Safety in the Shop: Hand Tools. 12 minutes, Coronet Film and Video, 1971. Available for purchase from Coronet Film and Video, 108 Wilmot Road, Deerfield, Illinois 60015-9925 (Also available on videotape)

        (2) Take Two for Safety (Individual tapes in a series). Available from Du Pont Safety Services. For more information, call 1-800-532-SAFE

    b. Written materials

        (1) 29 CFR 1910 of the OSHA General Industry Safety and Health Standards -- Selected sections as needed

        (2) Accident Prevention Manual for Industrial Operations--Engineering and Technology (Current Edition), from the National Safety Council

        For current catalog, write or call the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois 60611 or 1-800-621-7619; or contact the Oklahoma Safety Council, P.O. Box 14686, Oklahoma City, Oklahoma 73113 or (405) 848-8626

        (3) Best's Safety Directory (Current Edition), from the A.M. Best Company, Ambest Road, Oldwick, New Jersey 08858 or (201) 439-2200

        (4) Using Hand Tools and Portable Power Tools Safely (booklet), from the National Safety Council

        See the address and phone number listed under (2)

(5) Tool catalogs for the hand tools used at your job site

(6) Safety posters, available from the National Safety Council in their Poster Directory (Current Edition)

See the address and phone number listed under (2)

c. Chalkboard, flip chart, chalk, marking pens, etc.

3. SHOW samples of hand tools for the discussion of each tool

   HINT: The tools should be those actually used at your job site.

4. EMPHASIZE the importance of following the manufacturer's instructions for proper use and safety with any hand tool

5. EXPLAIN or REVIEW your company's safety policies or guidelines for each hand tool, as you discuss each tool

   HINT: Does your company have policies or guidelines for using each tool, storing each tool, and redressing or replacing each tool?

6. DEMONSTRATE the proper use and care of each tool

7. QUIZ participants on the proper use and care of each tool, after you have finished discussing each tool

   HINT: Ask someone to demonstrate the proper use and care of a specific hand tool, then evaluate (or have the other participants evaluate) the person's performance. Always suggest ways to improve performance!

INSTRUCTOR'S GUIDELINES

Causes of Accidents with Hand Tools

1. DISCUSS the common causes of accidents
2. EMPHASIZE the role of human failure in accidents
3. INVITE persons involved in accidents with hand tools to discuss their experiences

HAND TOOLS

CAUSES OF ACCIDENTS WITH HAND TOOLS

HUMAN FAILURE -- 88%

Using the wrong tool for the job

Using the right tool in the wrong way

Using a defective tool in any way

HAZARDOUS EQUIPMENT -- 10%

PURE ACCIDENT -- 2%

INSTRUCTOR'S GUIDELINES

Glossary

1. DISCUSS the terms and definitions

2. SHOW examples of each term, if possible

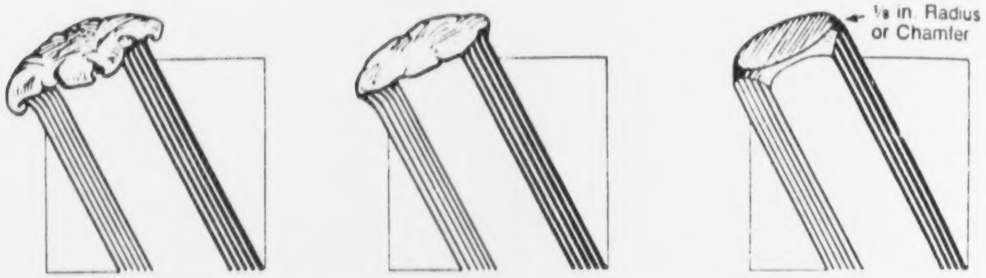
   NOTE: Especially important are examples of mushroomed tools, such as chisels, and the tang on a file. In this unit, CAUTION notices are associated with an exposed tang on a file and with mushroomed tools.

3. ADD terms and definitions that apply to your job site

HAND TOOLS

GLOSSARY

1. Chisel -- A striking tool used for removing or stripping excess material, cutting steel and masonry, constructing joints, and other uses
2. Crosscut saw -- A saw used to cut across the grain of wood
3. Files -- A hand tool used to smooth and shape surfaces on which edge-cutting tools cannot be used
4. Fret -- An ornamental pattern
5. Miter -- Cut made at an angle for joining 2 pieces of wood so that they will form an angle
6. Miter box -- Device for guiding a backsaw at the proper angle for cutting a miter joint in wood
7. Mushrooming -- A gradual wearing-away of the original shape of a tool head or point, especially on a striking tool



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8. Ripsaw -- A saw used to cut with the grain of wood
9. Soapstone -- Soft stone with a soapy texture, used for marking metal
10. Tang -- A piece that extends from the blade and connects with the handle, such as on a file

INSTRUCTOR'S GUIDELINES

General Safety Rules

1. DISCUSS each of the rules

   HINT: For each rule, give examples of accidents that could happen when the rule is not followed! Your examples should apply to your job site and to specific work areas at your job site.

2. DISCUSS each of the General Safety Rules

Rule 1	Explain the difference between using "any" tool and using the right tool for a given job, i.e., why is it important to choose the right kind of hand saw, hammer, pliers, etc? Demonstrate the results of using the wrong hand tool for a given job, if possible and if safe to do so
Rule 2	Show examples of sharp hand tools and dull hand tools, especially two examples of the same tool (sharp and dull) Demonstrate how the quantity and the quality of work changes when using sharp tools, as compared to using dull tools
Rule 3	Outline your policy for tool management
Rule 4	Explain your policy for replacing and repairing hand tools
Rule 5	Emphasize the role of human failure in accidents
Rule 6	Show examples of personal protective equipment available, and how participants can get needed equipment before starting a job requiring personal protective equipment
Rule 7	Explain your policy for storing hand tools on the job Give examples of accidents resulting from unsafe storage of hand tools

HAND TOOLS

GENERAL SAFETY RULES

1. USE the right tool for the job
2. KEEP sharp tools sharp and all tools clean
3. INSPECT tools often
4. REPAIR or REPLACE damaged or broken tools before using them again
5. PAY ATTENTION at all times

   REMEMBER: Human failure is the most common cause of accidents.

6. WEAR the right kind of personal protective equipment, when needed

   NOTE: Follow all OSHA guidelines for personal protective equipment.

7. STORE all tools properly when not in use

   EXAMPLE: Store tools in a safe place. Do not carry sharp tools in your pockets, and protect the sharp edges of tools kept in tool boxes and other storage areas.

INSTRUCTOR'S GUIDELINES

General Storage Rules

1. EXPLAIN your policy for storing hand tools (You should have explained the policy under Rule 7 of the General Safety Rules)

2. DISCUSS each of the General Storage Rules

Rule 1	Explain that storing tools safely includes placing hand tools in a safe location while you are using the tool Describe safe and unsafe places to store tools
Rule 2	Describe safe and unsafe practices for storing tools while they are being used Emphasize the benefit to the tool and the handler of following safe storage practices Show examples of storage methods used at your job site
Rule 3	Show examples of hand tools with sharp edges and describe the possible hazards from these tools if they are not guarded while in storage and on the job Show examples of hand tools with guards, such as saw blades
Rule 4	Identify storage areas at your job site, and any procedures required for removing and returning hand tools
Rule 5	Describe common defects, wear, or damage to look for when inspecting hand tools -- Use examples of hand tools to demonstrate a typical inspection Emphasize the importance of inspecting hand tools before using them
Rule 6	Explain your policy for repairing hand tools Describe possible accidents that could result if a hand tool is not repaired when needed
Rule 7	Discuss the types of tool boxes, chests, and cabinets used at your job site Describe unsafe uses of tool boxes, chests, and cabinets, and the hazards that result from such unsafe uses

HAND TOOLS

GENERAL STORAGE RULES

1. KEEP all tools in a safe place

   EXAMPLE: Tools can fall from ladders, scaffolds, overhead pipes, and other places if they are left unattended during and after use.

2. STORE all tools safely while you are using them

   EXAMPLE: Lay down a handsaw flat on a table, to protect the saw teeth from being bent. Also use the right type of carrying belt, pouch, or other method of storing tools while you are using them.

3. GUARD the sharp edges of tools in storage and on-the-job

   EXAMPLE: Some tools may have their own carrying case to guard pointed or sharp edges, handsaws often have guards that slide over the saw teeth, etc.

4. CONTROL all tools from specific storage areas

   NOTE: Central storage areas for tools will help you (1) find the right tool when you need it, (2) inspect the tool before you use it, and (3) repair the tool if needed.

5. INSPECT all stored tools often

   NOTE: Remove any defective or worn tools from service immediately. Repair any tools as needed. All stored tools should be in safe condition and ready to use.

6. REPAIR all tools as needed

   NOTE: Check tools often for damage and wear, especially tools that are used every day such as chisels, hammers, wrenches, etc.

7. USE the right kind of tool boxes, tool chests, and tool cabinets

   NOTE: Do not use tool boxes as saw horses, step-ladders, or for storing anything other than tools. Use tool boxes for their intended purposes only.

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INSTRUCTOR'S GUIDELINES

Hammers -- Types and Uses

1. EXPLAIN that safety with hammers includes using the right type of hammer for the job

2. DISCUSS the uses of each type of hammer

   HINT: Show examples of hammers used at your job site.

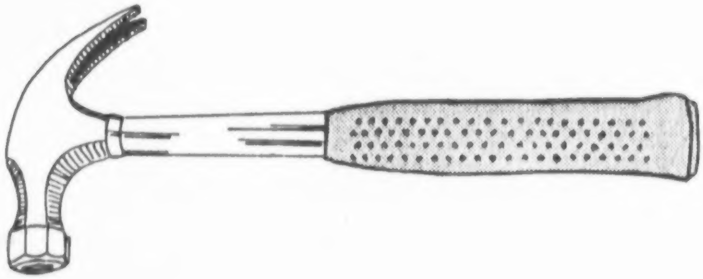
HAND TOOLS

HAMMERS

Types and Uses

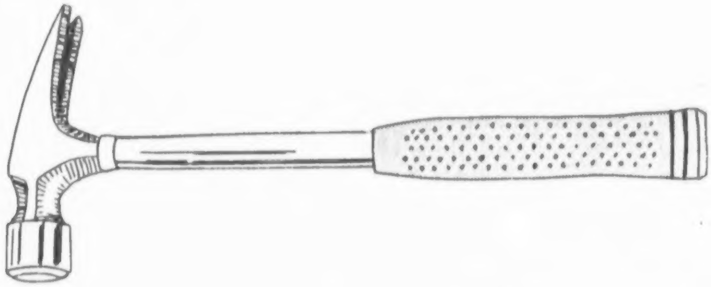
Curved-claw Hammer

Drive and pull nails



Straight-claw Hammer

Drive and pull nails, dismantle and wreck



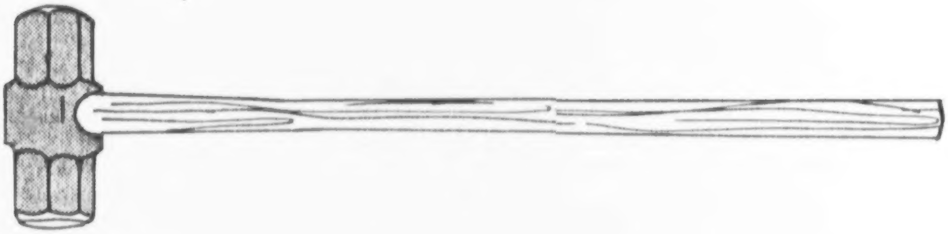
HAND TOOLS

HAMMERS

Types and Uses

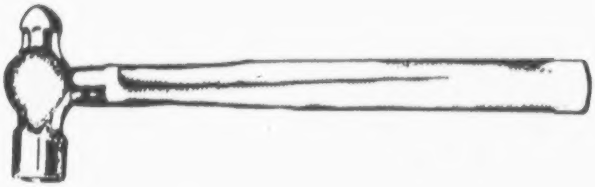
Sledgehammer

Break concrete, drive stakes



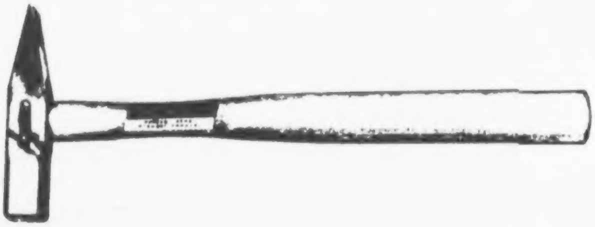
Ball Peen Hammer

General purpose



Riveting Hammer

Set rivets



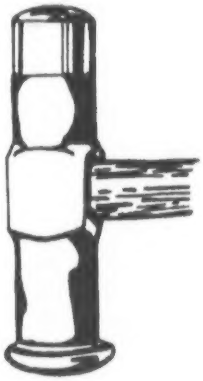
HAND TOOLS

HAMMERS

Types and Uses

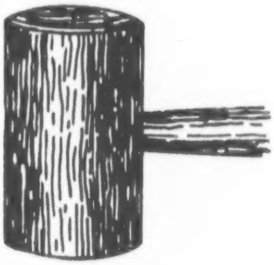
Body or Raising Hammer

Used mainly as a finish tool,
cornice and stainless steel work



Mallet

Used where a metal hammer would dent
or damage material



INSTRUCTOR'S GUIDELINES

Hammers -- General Safety Rules

Rule 1 Show examples of personal protective equipment needed when using hammers

Describe situations and hazards with hammers that show the need for personal protective equipment

Rule 2 Describe different jobs at your job site, and the different hammers needed for each job

Describe the results from using the wrong hammer for a given job

Rule 3 Describe the hazards that exist when using a hammer with a striking tool

Rule 4 Describe the hazards of using any mushroomed striking tool with a hammer

Emphasize the CAUTION

Rule 5 Describe the hazards from striking two hammer faces together

Rule 6 Demonstrate the correct way to hold a hammer

Rule 7 Describe a correct strike and the hazards of a poor hammer strike

Rule 8 Describe the hazards from using a hammer with a loose handle

Rule 9 Explain why this rule is important

Rule 10 Demonstrate the safe way of using a hammer with a wood block

Emphasize the CAUTION

HAND TOOLS

HAMMERS

General Safety Rules

1. USE the right kind of personal protective equipment

2. USE the right hammer for the job

3. WEAR safety goggles when using a hammer with a striking tool, such as a chisel or stake

   NOTE: Follow all OSHA guidelines for personal protective equipment.

4. NEVER STRIKE a mushroomed tool

   CAUTION: SPLINTERS COULD STRIKE YOU IN YOUR EYES.

5. DO NOT STRIKE two hammer faces together

6. HOLD the hammer near the end of the handle

   NOTE: This will increase your accuracy and decrease your chances of hitting your fingers with the hammer.

7. STRIKE hammer blows squarely with the face of the hammer

8. CHECK for a tight handle before using the hammer

9. CHECK the immediate area for people and obstructions before swinging the hammer

10. AVOID using a hammer as a nail bar to pull nails

    CAUTION: THE PRESSURE ON THE HANDLE COULD CAUSE THE HANDLE TO BREAK. IF YOU MUST USE A HAMMER AS A NAIL BAR, USE A WOOD BLOCK FOR EXTRA LEVERAGE TO LESSEN THE PRESSURE ON THE HANDLE.

INSTRUCTOR'S GUIDELINES

Screwdrivers

Rule 1	Show examples of personal protective equipment needed when using screwdrivers Describe situations and hazards with screwdrivers that show the need for personal protective equipment
Rule 2	Explain that, if a screwdriver is too large, it will damage the head of the screw; if a screwdriver is too small, it will be damaged
Rule 3	Compare examples of screwdrivers with square-edged blades and with mushroomed blades
Rule 4	Explain the hazards of using a screwdriver to pry
Rule 5	Demonstrate the safe way to drive a screw while protecting the hands Emphasize the CAUTION
Rule 6	Describe situations at your job site where screwdrivers could be unsafely exposed to extreme heat, and the safe ways to avoid those situations
Rule 7	Describe situations at your job site where screwdrivers could be unsafely exposed to sources of electricity, and the safe ways to avoid those situations
Rule 8	Explain how an oily handle could create a hazard if it is not cleaned

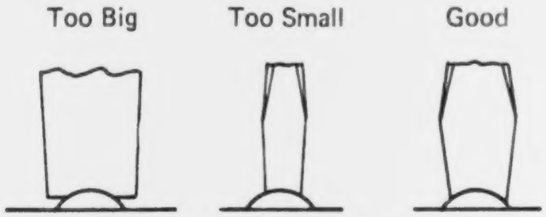
SCREWDRIVERS

1. USE the right kind of personal protective equipment

   NOTE: Follow all OSHA guidelines for personal protective equipment.

2. USE the right screwdriver for the job

   NOTE: Also use the right size blade or bit for the screw. The wrong size blade or bit can cause the screwdriver to slip.



3. KEEP the blade or bit of all screwdrivers square-edged

   NOTE: Screwdrivers with mushroomed blades or bits can slip more easily and cause an injury.

4. DO NOT USE any screwdriver to pry objects

5. DO NOT HOLD the screw after it is in place

   CAUTION: THE SCREWDRIVER COULD SLIP AND CUT YOUR HAND.

6. DO NOT EXPOSE screwdrivers to extreme heat

   NOTE: Extreme heat can weaken a screwdriver.

7. KEEP the tip of a screwdriver away from power outlets and other sources of electric current

   EXAMPLE: Power outlets, frayed power cords, running motors, light sockets, exposed live wiring, etc.

8. CLEAN OFF handles of screwdrivers after every use

INSTRUCTOR'S GUIDELINES

Wrenches -- Types and Uses

1. EXPLAIN that safety with wrenches includes using the right type of wrench for the job

2. DISCUSS the uses of each type of wrench

   HINT: Show examples of wrenches used at your job site, and the jobs for which each wrench is used.

HAND TOOLS

WRENCHES

Types and Uses

NOTE: This list is not complete.

Type	Uses
Open-end	General purpose Used where there is plenty of room for movement
Box-end	Used where there is limited room for movement
Combination (Open- and Box-end)	Combines uses of open-end and box-end
Adjustable	Used where there is plenty of room for movement
Pipe wrench	Used to work on pipes and rods
Socket	Used to apply force in one direction only

INSTRUCTOR'S GUIDELINES

Wrenches -- General Safety Rules

Rule 1	Describe different jobs at your job site, and the different wrenches needed for each job Describe the results from using the wrong wrench for a given job (or from using pliers instead of a wrench)
Rule 2	Explain why this rule is important
Rule 3	Show an example of a wrench with a "cheater" and describe the hazards of using cheaters Emphasize the CAUTION
Rule 4	Emphasize the NOTE Explain the diagram "Safe Use of the Adjustable Wrench"
Rule 5	Describe situations at your job site where wrenches could be exposed to excessive heat, and the safe ways to avoid those situations
Rule 6	Explain why this rule is important and how it could happen

HAND TOOLS

WRENCHES

General Safety Rules

1. USE the right wrench for the job

2. MAKE SURE the wrench fits tightly on the nut or bolt being tightened or removed

   NOTE: Use the proper size open-end wrench that fits the nut exactly.

3. DO NOT USE an "extender" or "cheater" on any wrench handle

   CAUTION: YOU COULD INJURE YOURSELF, DAMAGE EQUIPMENT, OR BREAK THE WRENCH IF THE EXTENDER SLIPS.

4. With adjustable wrenches, APPLY force on the fixed jaw, not on the adjustable (weaker) jaw

   NOTE: Adjustable wrenches have special hazards. Use a different type of wrench, if possible.

5. DO NOT EXPOSE wrenches to excessive heat

   NOTE: Excessive heat can ruin a wrench.

6. DO NOT CHANGE the shape of a wrench in any way

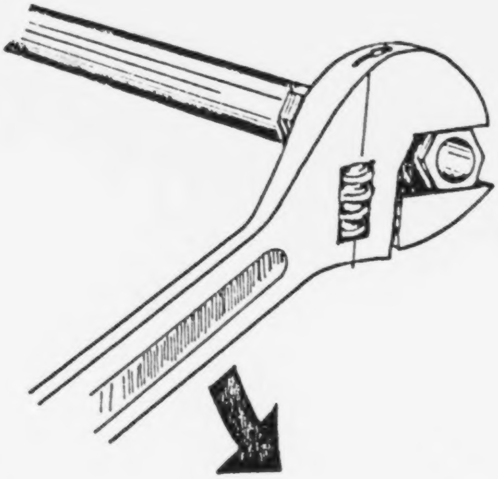
HAND TOOLS

WRENCHES

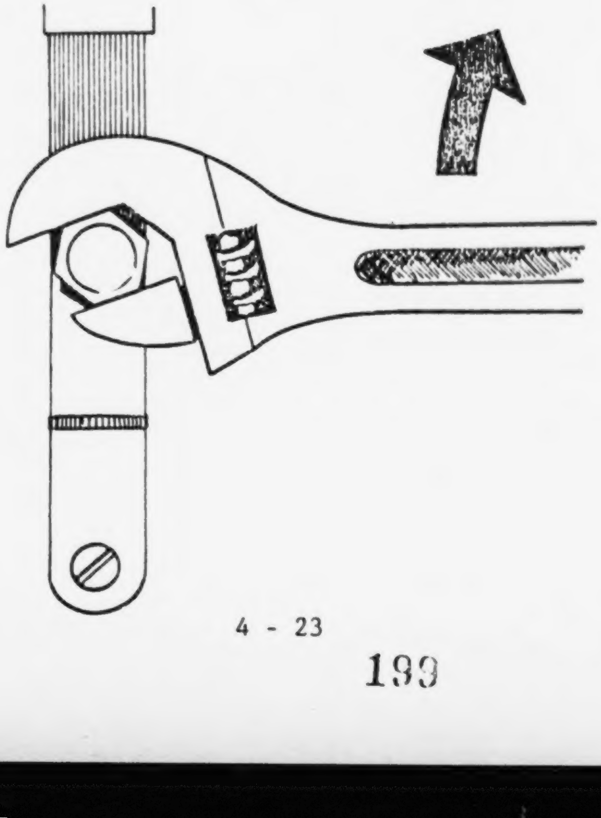
General Safety Rules

Safe Use of the Adjustable Wrench

YES -- Force is applied to the fixed jaw



NO -- Force is applied to the adjustable (weaker) jaw



INSTRUCTOR'S GUIDELINES

Pliers -- Types and Uses

1. EXPLAIN that safety with pliers includes using the right type of pliers for the job

2. DISCUSS the uses of each type of pliers

   HINT: Show examples of pliers used at your job site.

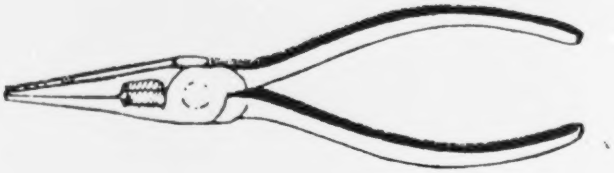
HAND TOOLS

PLIERS

Types and Uses

Long nose

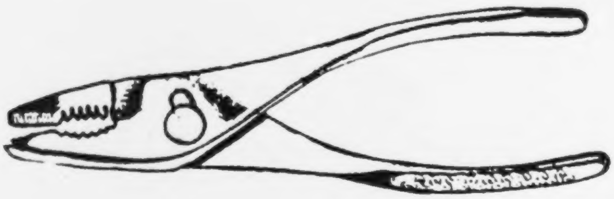
For deeper reach into
work area



Combination

For holding an object that is
hard to hold with your hands

Should **not** be used as a wrench
for removing nuts -- this could
damage the jaw



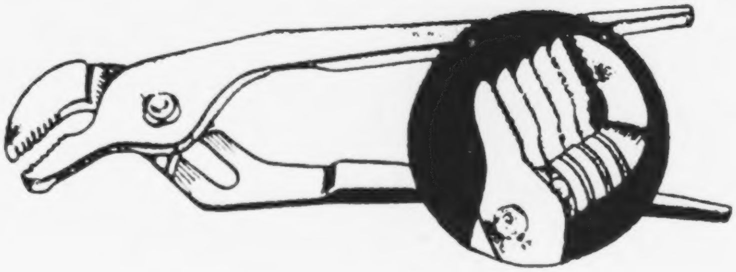
HAND TOOLS

PLIERS

Types and Uses

Adjustable

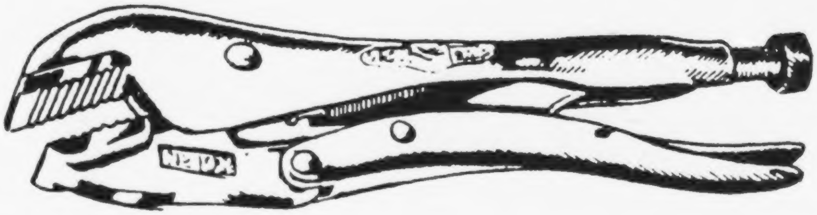
For using a wide range of jaw openings and when heavy pressure is needed



Locking

For locking at any size with the needed amount of pressure

For use as nonlocking pliers



INSTRUCTOR'S GUIDELINES

Pliers -- General Safety Rules

1. EMPHASIZE the WARNING

2. DISCUSS each of the General Safety Rules

Rule 1	Describe different jobs at your job site and the different pliers needed for each job
	Describe the results from using the wrong pliers for a given job (Discuss the EXAMPLE and give others)
Rule 2	Show examples of personal protective equipment needed when using pliers (Such as for the EXAMPLE situation)
	Describe situations and hazards with pliers that show the need for personal protective equipment
Rule 3	Describe situations at your job site where pliers could be exposed to excessive heat, and the safe ways to avoid those situations
Rule 4	Show examples of damaged pliers from hammering
Rule 5	Demonstrate the wrong and the right way to cut
Rule 6	Describe the hazards of using "cheaters"
	Emphasize the CAUTION
Rule 7	Explain this rule as "preventive maintenance"

HAND TOOLS

PLIERS

General Safety Rules

WARNING: Pliers that have plastic-coated handles are made for comfort, not to protect against electrical hazards. Use only pliers with proper insulated handles to protect against electrical hazards.

1. USE the right type of pliers for the job

   EXAMPLE: You could damage long-nose pliers when using them to bend large wire.

2. WEAR the right kind of personal protective equipment

   EXAMPLE: You should wear the right kind of eye protection, to keep wire from hitting you in the eyes after you cut the wire.

3. DO NOT EXPOSE pliers to excessive heat

   NOTE: Too much heat can destroy the strength of pliers.

4. DO NOT HAMMER any object with pliers

   NOTE: You could damage the blades of the pliers, or crack the handles.

5. CUT at right angles only

   NOTE: Twisting the pliers when cutting can damage the blades.

6. DO NOT EXTEND the handle with "extenders" or "cheaters"

   CAUTION: YOU COULD INJURE YOURSELF, OR DAMAGE OR BREAK THE TOOL IF THE EXTENDER SLIPS.

7. OIL pliers as needed

   NOTE: A drop of oil on the hinge of the pliers can increase the life of the tool and make the tool easier to use.

Adapted with permission from the Kansas Safety Education Handbook, Volume III, Kansas State Department of Education.

INSTRUCTOR'S GUIDELINES

Files -- Types of Files

1. EMPHASIZE the CAUTION
2. EXPLAIN that safety with files includes using the right type of file for the job
3. SHOW the types of surfaces and shapes on which each file is used, if possible

   EXAMPLE: Show an inside angle for a triangular file, show concave and convex surfaces for a half-round file, etc.

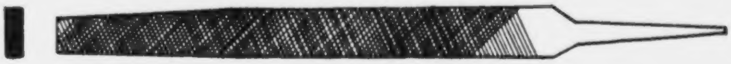
HAND TOOLS

FILES

Types of Files

CAUTION: NEVER USE A FILE WITHOUT A HANDLE. THE EXPOSED TANG COULD PIERCE YOUR HAND AND CAUSE A SERIOUS INJURY.

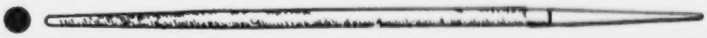
Flat



Draw filing
Sharpening mill saws
Used by machinists
Used by jewelers

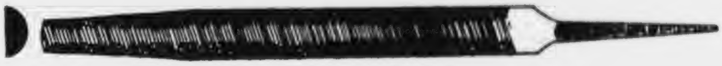
*Removing metal quickly

Round



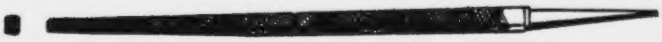
Enlarging round holes
Shaping inside angles

Half-round



Used on concave, convex, and flat surfaces

Square



Enlarging square shapes
Filing slots, keyways, and general filing

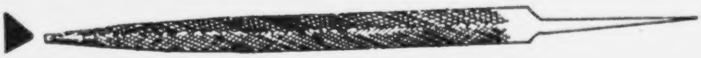
*Often used instead of equal flat files because the square file has 4 filing surfaces

HAND TOOLS

FILES

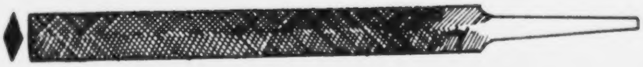
Types of Files

Triangular (Three-Square)



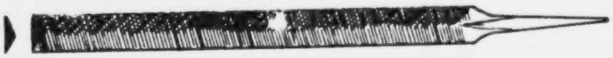
Filing inside angles
Clearing-out square corners
Filing taps and cutters

Slitting



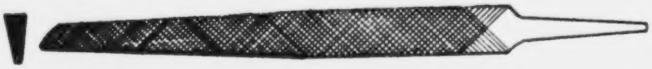
Used on carbide, stainless steel, hardened steel, glass, or ceramic

Cant saw



Filing crosscut saws with M-shaped teeth

Knife



Used mainly in tool and die work that involves acute angles (less than 90 degrees)

INSTRUCTOR'S GUIDELINES

Files -- General Safety Rules

Rule 1	Describe different jobs and the files needed for each job
Rule 2	Emphasize the CAUTION
Rule 3	Demonstrate the way to clean a file with a file card Emphasize the NOTE
Rule 4	Emphasize the NOTE
Rule 5	Describe hazards from not securing the work
Rule 6	Emphasize the NOTE Discuss the hazards of using a file with a lathe
Rule 7	Explain how a file has cutters that are set at an angle to cut in one direction only -- trying to file in the wrong direction ruins the file

HAND TOOLS

FILES

General Safety Rules

1. CHOOSE the right kind of file for the job

   NOTE: The right file can help prevent injuries, increase the life of the file, and make your job easier.

2. DO NOT USE a file that does not have a secure handle

   CAUTION: THE EXPOSED TANG COULD PIERCE YOUR HAND AND CAUSE A SERIOUS INJURY.

3. CLEAN all files with a file-cleaning card only

   NOTE: Do not clean a file by striking it against another object. Files chip easily. Use only the correct file-cleaning card to clean files.

4. DO NOT HAMMER or PRY an object with a file

   NOTE: Files chip or break easily. Use a file for filing, not for hammering, prying, punching, chiseling, or other uses.

5. CLAMP the work to be filed in a vise at about waist-height

   NOTE: You must apply pressure to the file when filing. This pressure could cause the work to move or slip away.

6. HOLD the file handle securely in one hand and GUIDE the point of the file with the thumb and index finger of your other hand

   NOTE: This technique will help you control the file and finish the job safely and correctly.

   For Lathe Work -- Use the file with your left hand, keeping the file and your hands clear of the chuck jaws or the dog

7. PUSH the file forward as you bear down on it, then RELEASE your pressure on the file as you bring it back toward you

   NOTE: If you do not release your pressure on the return stroke, you will wear out the file teeth quickly.

   For Lathe Work -- Take long, even strokes across the rotating work

INSTRUCTOR'S GUIDELINES

Chisels -- Types of Chisels

1. EXPLAIN that safety with chisels includes using the right type of chisel for the job

2. DISCUSS the uses of each type of chisel

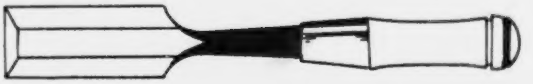
   HINT: Show examples of the types of chisels used at your job site.

HAND TOOLS

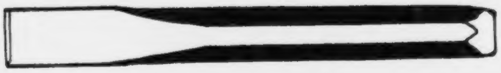
CHISELS

Types of Chisels

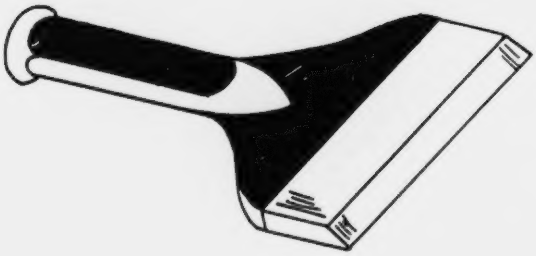
Wood chisel



Cold chisel



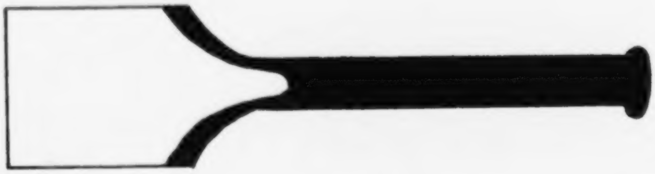
Brick chisel



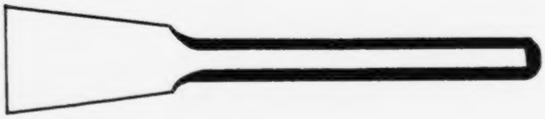
CHISELS

Types of Chisels

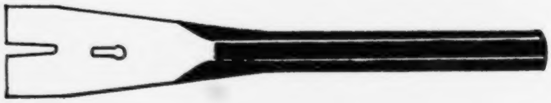
Stripping chisel



Floor chisel



Ripping chisel



INSTRUCTOR'S GUIDELINES

Chisels -- General Safety Rules

Rule 1	Show examples of personal protective equipment needed when using chisels
	Describe situations and hazards with chisels that show the need for personal protective equipment
Rule 2	Describe the possible damage to the chisel and the work, and any hazards, from using the wrong size chisel
Rule 3	Show examples of correct and incorrect combinations of chisels and hammers
	Discuss the special considerations for using wood chisels
Rule 4	Show examples of dangerous chisels and explain the hazards from using bent, cracked, or chipped chisels
Rule 5	Demonstrate the correct way to hold a chisel and explain why the direction is important
	Emphasize the CAUTION
	Discuss the special hazards for using wood chisels if the handle has splinters
Rule 6	Demonstrate the correct way to hold a chisel while working
Rule 7	Show examples of chisels with mushroomed heads and explain why they are dangerous
	Emphasize the CAUTION
Rule 8	Describe situations where persons would try to use a chisel as a pry or wedge, and suggest ways to use the proper tool instead of a chisel

HAND TOOLS

CHISELS

General Safety Rules

1. WEAR the right kind of personal protective equipment

   NOTE: Eye protection is especially important when using striking tools.

2. USE the right chisel for the job

   NOTE: The chisel should also be large enough for the job, so that you are using the blade of the chisel, not the point or a corner of the blade.

3. USE the right hammer for the job

   NOTE: The hammer should be designed for use with the chisel, and the striking face of the hammer should be about 3/8 inches larger (diameter) than the head of the chisel.

   For Wood Chisels -- Check the work for nails and secure the work before you start the job. Nails or other metal can chip the chisel and cause the chips to fly

4. THROW AWAY any chisel that is bent, cracked, or chipped

5. HOLD the chisel pointing away from your body

   CAUTION: IF YOU HOLD THE CHISEL TOWARD YOUR BODY, THE CHISEL COULD SLIP AND STRIKE YOU.

   For Wood Chisels -- Check that wooden handles are free of splinters before holding the chisel

6. KEEP both hands away from the blade at all times

7. STRIKE only a chisel that has a properly-beveled head

   CAUTION: A CHISEL WITH A MUSHROOMED-HEAD COULD CAUSE YOUR HAMMER TO GLANCE OFF THE CHISEL.

8. DO NOT PRY objects with a chisel or use a chisel as a wedge

   NOTE: Chisels can break if they are used to pry objects, or if used as wedges.

INSTRUCTOR'S GUIDELINES

Handsaws -- Types and Uses

1. EXPLAIN that safety with handsaws includes using the right type of handsaw for the job

2. DISCUSS the uses of each type of handsaw

   HINT: Show examples of the types of handsaws used at your job site.

3. SHOW examples of cuts made with each handsaw and explain why a particular handsaw can make that cut better than another type of handsaw

4. EXPLAIN the cutting ability of the different types of sawblades found on each handsaw

HAND TOOLS

HANDSAWS

Types and Uses

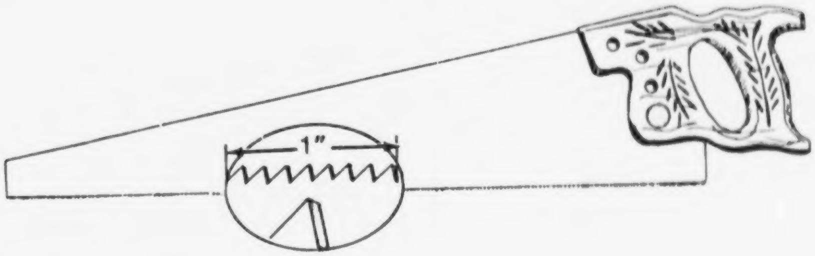
Type	Uses
Crosscut saw	Cut across the grain of wood
Ripsaw	Cut with the grain of wood
Dovetail saw	Cut smoothest possible joints, such as tenons, mortises, etc
Backsaw (Miter-box saw)	Cut fine joints
	Cut miters or square ends in a miter box
Compass saw (Keyhole saw)	Cut inside corners, curves, circles, and frets
Coping saw	Cut curves
	Shape ends of molding and trim for joints
Hacksaw	Cut metal

HAND TOOLS

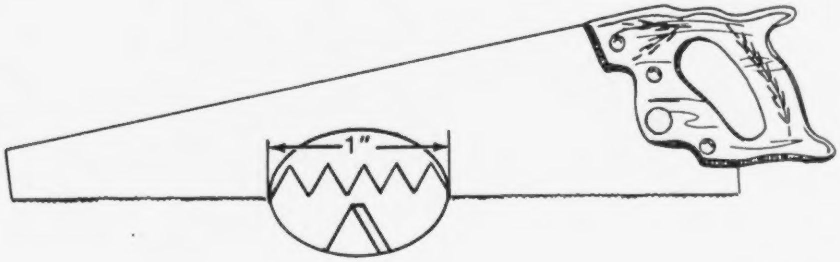
HANDSAWS

Types and Uses

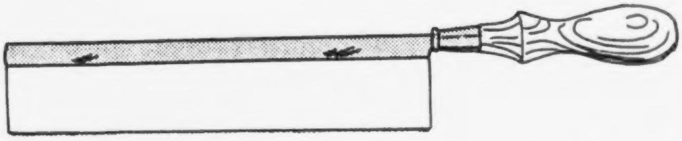
Crosscut Saw



Ripsaw



Dovetail Saw

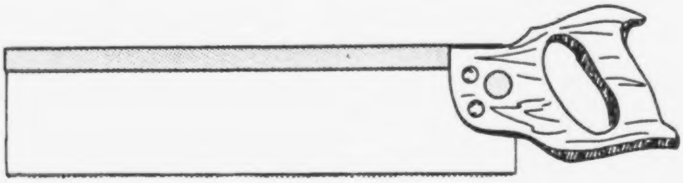


HAND TOOLS

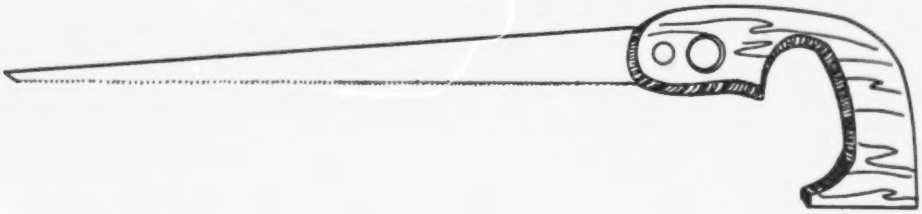
HANDSAWS

Types and Uses

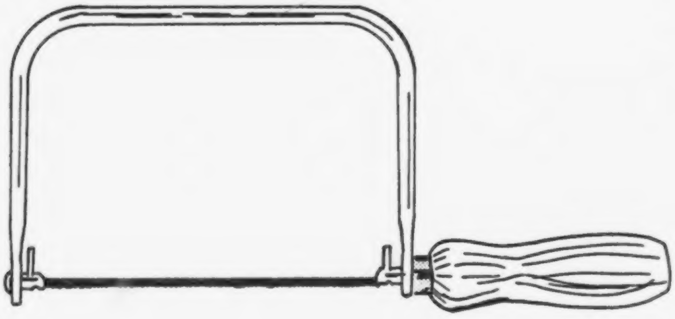
Backsaw



Compass Saw



Coping Saw

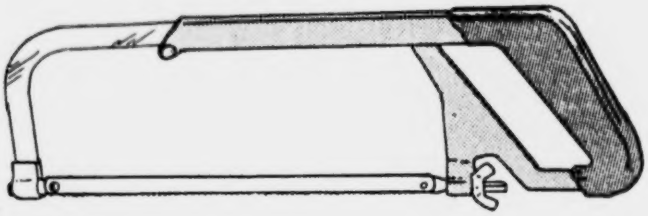


HAND TOOLS

HANDSAWS

Types and Uses

Hacksaw



INSTRUCTOR'S GUIDELINES

General Safety Rules -- Crosscut Saw, Ripsaw, Dovetail Saw, and Backsaw

Rule 1 Show examples of personal protective equipment needed when using handsaws

Describe situations and hazards with handsaws that show the need for personal protective equipment

Rule 2 Show examples of dangerous cutting material and the hazards from using it (Explain why it is important to check the stock before cutting)

Rule 3 Describe dangerous situations and ways to prevent them by supporting both ends of the cutting material

Describe possible accidents if this rule is not followed

Rule 4-7 Discuss each rule as you demonstrate the safe way to cut

Emphasize the CAUTION under Rule 6

HAND TOOLS

HANDSAWS

General Safety Rules

Crosscut Saw, Ripsaw, Dovetail Saw, and Backsaw

1. USE the right kind of personal protective equipment

2. CHECK the cutting material for nails and any other metal before cutting

3. SUPPORT both ends of the cutting material

   NOTE: This will keep the material from moving during the cut and causing your saw to slip dangerously on the downward stroke.

4. REST the saw blade on the edge of the material to start the cut

5. KEEP your hands at a safe distance from the sawblade

6. USE your thumb as a guide to CUT a groove in the material with long, slow strokes

   CAUTION: BE SURE YOUR THUMB AND FINGERS ARE NOT IN THE PATH OF THE SAWBLADE.

7. CUT with long strokes and APPLY force lightly on the downward stroke

INSTRUCTOR'S GUIDELINES

General Safety Rules -- Compass Saw

Rule 1	Show examples of personal protective equipment and describe the hazards that require such protective equipment
Rule 2-4	Discuss each rule as you demonstrate the safe way to cut

General Safety Rules -- Coping Saw

Rule 1	Show examples of personal protective equipment and describe the hazards that require such protective equipment
Rule 2	Demonstrate the safe way to support the cutting material Describe the hazards from not supporting the cutting material
Rule 3-5	Discuss each rule as you demonstrate the safe way to cut

HAND TOOLS

HANDSAWS

General Safety Rules

Compass Saw

1. USE the right kind of personal protective equipment
2. HOLD the cutting material securely
3. CUT away from the hand holding the cutting material
4. DO NOT FORCE the saw blade into the cut

   NOTE: This could bend or break the saw blade.

Coping Saw

1. USE the right kind of personal protective equipment
2. SUPPORT the cutting material with a vise or a vise and a saddle
3. With a vise support, PUSH the saw gently back and forth to cut

   With a vise and saddle support, PULL the saw gently up and down to cut
4. USE full strokes
5. GUIDE the saw blade carefully through the cut

   NOTE: The blades are thin and can break easily.

INSTRUCTOR'S GUIDELINES

General Safety Rules -- Hacksaw

Rule 1	Show examples of personal protective equipment and describe the hazards that require such protective equipment
Rule 2	Demonstrate the safe way to support the cutting material
	Describe the hazards from not clamping the cutting material
Rule 3	Demonstrate how to mark the cutting line
Rule 4	Demonstrate how to check the blade
	Demonstrate how to replace the blade
Rule 5-8	Discuss each rule as you demonstrate the safe way to cut
	Emphasize the CAUTION under Rule 8

HAND TOOLS

HANDSAWS

General Safety Rules

Hacksaw

1. USE the right kind of personal protective equipment

2. CLAMP the cutting material securely in a bench vise

   NOTE: Leave about 6 inches of overhang.

3. MARK the cutting line on the metal with soapstone

4. CHECK the hacksaw for a tight blade, sharp teeth, and correct direction of teeth (away from you)

5. PLACE the saw blade on the soapstone mark

6. HOLD the saw firmly by the handle and the front of the frame

7. CUT with a forward and back movement, about 40 strokes per minute. APPLY pressure on the forward stroke and LIFT the saw lightly on the return stroke

   NOTE: Cut on the forward stroke only and use the entire length of the blade.

8. EASE UP on the pressure when reaching the end of the cut

   CAUTION: IF YOU DO NOT DECREASE YOUR PRESSURE WHEN FINISHING THE CUT, YOU COULD PUSH YOUR HAND INTO THE SHARP EDGE OF THE PIPE STILL HELD IN THE VISE.

INSTRUCTOR'S GUIDELINES

Handsaws -- Storing Handsaws

Rule 1	Show examples of saws with damaged teeth and describe actions that could damage saw teeth by contact with metal surfaces on the job
Rule 2	Emphasize the NOTE Explain how to sharpen saw teeth at your job site
Rule 3	Demonstrate the safe way to clean saw blades Emphasize the CAUTION
Rule 4	Describe the storage methods at your job site and for specific work areas
Rule 5	Relate this rule to Rule 1
Rule 6	Show examples of guards for saw blades and describe the accidents that these guards can help prevent

HAND TOOLS

HANDSAWS

Storing Handsaws

1. PROTECT saw teeth from contact with metal surfaces

   NOTE: Metal surfaces could bend the saw teeth.

2. KEEP saw teeth sharp

   NOTE: Sharp saw teeth help keep the blade from binding during the cut.

   For Coping Saws -- Keep the blade tight by adjusting the nuts as needed

3. CLEAN saw blades with a lightly-oiled cloth after each use and before storing

   CAUTION: KEEP YOUR HANDS CLEAR OF THE TEETH.

4. STORE saws on racks or by the handle

5. LAY saws flat on work tables for temporary storage

   NOTE: This will help keep the saw teeth from bending.

6. USE the proper guards on saw blades after use

INSTRUCTOR'S GUIDELINES

Ladders -- General Safety Rules

Rule 1 Emphasize the importance of inspecting all ladders before they are used

Inspect a ladder as an example -- point out each item of inspection (Follow the items on the Ladder Inspection Checklist when giving your example inspection, and include other items if needed)

Rule 2 List other electrical hazards that exist at your job site that must be considered when using metal ladders

Rule 3 Discuss the hazards that these materials create

Rule 4 Give examples of uneven surfaces and explain why such surfaces are dangerous when using any ladder

Rule 5 Refer to the diagram

Rule 6 Explain your methods of tying-off a ladder

Rule 7 Explain why these situations are dangerous

Describe possible situations at your job site where ladders could be placed in such dangerous locations

Rule 8 Demonstrate how to secure the sections of an extension ladder

Test the locks and the rope

Rule 9 Discuss the hazards of reaching too far, instead of moving the ladder

Rule 10 Explain why facing the ladder is important

HINT: Facing away from the ladder involves a loss of coordination (an unnatural position), inability to hold onto each rung properly, and other hazards.

Rule 11 Explain the hazards created by allowing more than one person on a ladder at a time

Rule 12 Discuss the uses of the types of ladders at your job site and give examples of ladders being used for the wrong job

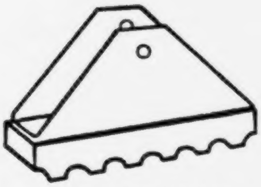
Describe dangerous situations created by storing ladders the wrong way

HAND TOOLS

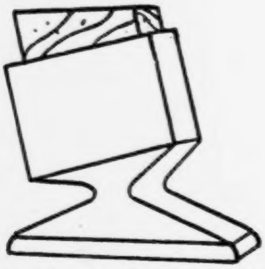
LADDERS*

General Safety Rules

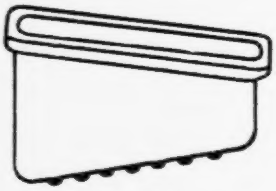
1. INSPECT all ladders before use for worn safety shoes, broken or loose rungs, and other defects



For Metal Stepladder



Rubber Shoe for Wood Extension Ladder



Rubber Shoe for Either Wood or Metal Stepladder

2. BE SURE metal ladders are clear of electrical hazards
3. CHECK ladder steps and hand rails for oil or other slippery materials before you climb
4. DO NOT USE ladders on uneven surfaces
5. SECURE the base of a ladder by extending the base from the building or other support at least one foot for every four feet of height
6. TIE-OFF the top and the base of the ladder with rope, wire, cement blocks, or sand bags
7. PLACE the ladder away from doors or other openings that are not blocked or guarded
8. SECURE the sections of two-section ladders with a rung lock

---

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LADDERS

9. DO NOT OVER-EXTEND your reach while on a ladder

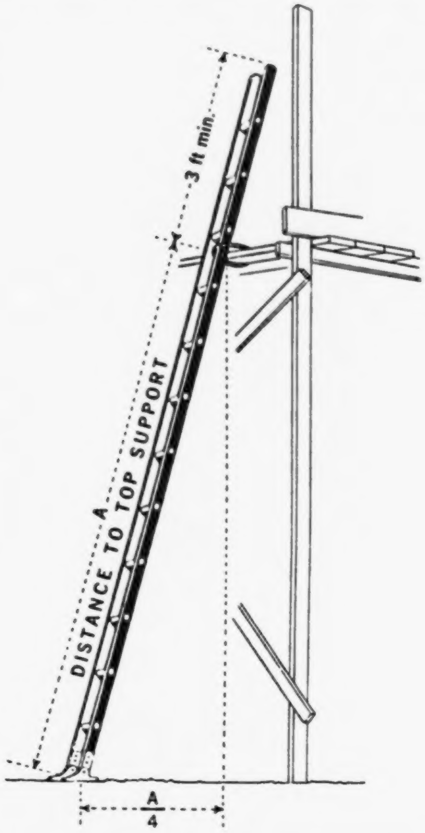
   NOTE: Move the ladder instead (but not while you are on it).

10. FACE the ladder when climbing up and down

11. ALLOW only one person on the ladder at a time

12. USE ladders only for their intended purpose and STORE ladders securely when not in use

    CAUTION: DO NOT USE A LADDER AS A MAKESHIFT SCAFFOLD.



Rule 5: Extend the base one foot for every four feet of height.

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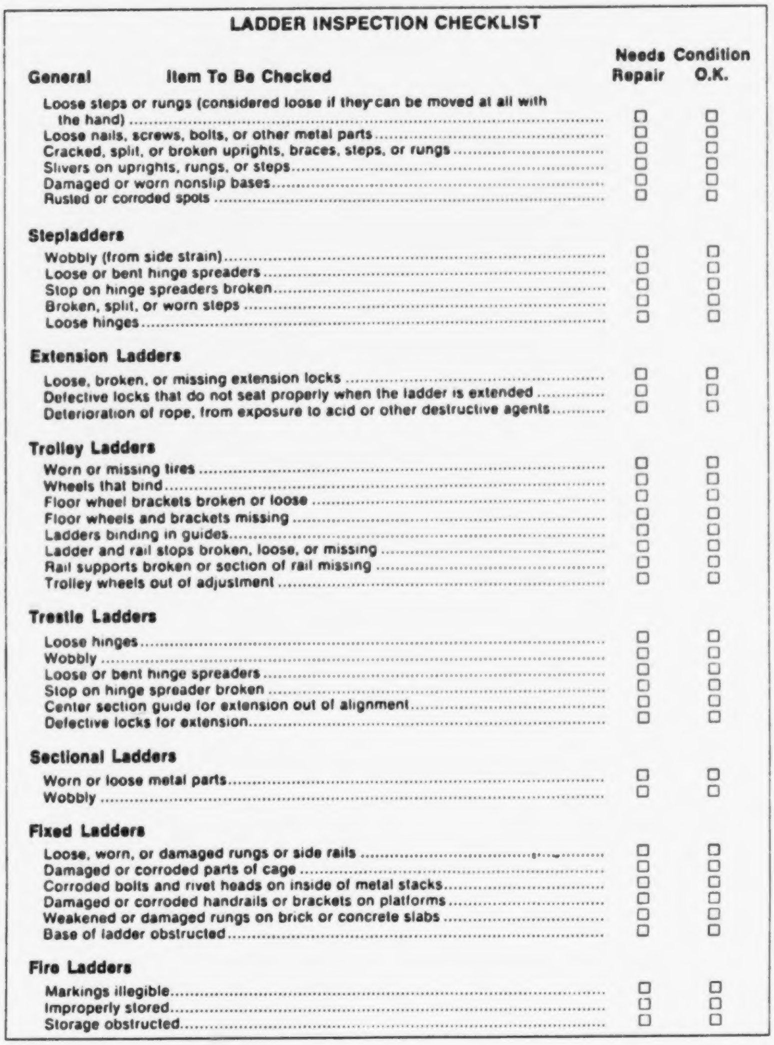
HAND TOOLS

LADDERS

General Safety Rules

Ladder Inspection Checklist



LADDER INSPECTION CHECKLIST

Item To Be Checked	Needs Repair	Condition O.K.
General		
Loose steps or rungs (considered loose if they can be moved at all with the hand)	☐	☐
Loose nails, screws, bolts, or other metal parts	☐	☐
Cracked, split, or broken uprights, braces, steps, or rungs	☐	☐
Slivers on uprights, rungs, or steps	☐	☐
Damaged or worn nonslip bases	☐	☐
Rusted or corroded spots	☐	☐
Stepladders		
Wobbly (from side strain)	☐	☐
Loose or bent hinge spreaders	☐	☐
Stop on hinge spreaders broken	☐	☐
Broken, split, or worn steps	☐	☐
Loose hinges	☐	☐
Extension Ladders		
Loose, broken, or missing extension locks	☐	☐
Defective locks that do not seat properly when the ladder is extended	☐	☐
Deterioration of rope, from exposure to acid or other destructive agents	☐	☐
Trolley Ladders		
Worn or missing tires	☐	☐
Wheels that bind	☐	☐
Floor wheel brackets broken or loose	☐	☐
Floor wheels and brackets missing	☐	☐
Ladders binding in guides	☐	☐
Ladder and rail stops broken, loose, or missing	☐	☐
Rail supports broken or section of rail missing	☐	☐
Trolley wheels out of adjustment	☐	☐
Trestle Ladders		
Loose hinges	☐	☐
Wobbly	☐	☐
Loose or bent hinge spreaders	☐	☐
Stop on hinge spreader broken	☐	☐
Center section guide for extension out of alignment	☐	☐
Defective locks for extension	☐	☐
Sectional Ladders		
Worn or loose metal parts	☐	☐
Wobbly	☐	☐
Fixed Ladders		
Loose, worn, or damaged rungs or side rails	☐	☐
Damaged or corroded parts of cage	☐	☐
Corroded bolts and rivet heads on inside of metal stacks	☐	☐
Damaged or corroded handrails or brackets on platforms	☐	☐
Weakened or damaged rungs on brick or concrete slabs	☐	☐
Base of ladder obstructed	☐	☐
Fire Ladders		
Markings illegible	☐	☐
Improperly stored	☐	☐
Storage obstructed	☐	☐

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HAND TOOLS
SELF-TEST 1

1. Keep all tools
   - a. in a safe place
   - b. in a convenient place
   - c. in an open area
   - d. around the work area after use, in case you need them later

2. Guard the sharp edges of tools
   - a. in storage
   - b. on-the-job
   - c. both (a) and (b)
   - d. none of the above

3. Repair all tools
   - a. if time allows
   - b. as needed
   - c. after the tool causes an accident
   - d. if you are told to do so

Read the paragraph below before answering the questions that follow --

You have just finished a safety training program at your job site. The topic of the meeting was "Storing Hand Tools." After you return to your work area, you notice that a co-worker has left a handsaw on a metal table. Someone in a nearby work area is working on some overhead pipes, and has left some tools laying on the pipes until the job can be finished after lunch. You also notice that some worn tools, such as chisels with mushroomed heads, are still being used.

4. You know that your co-worker is not following the proper rules for storing hand tools with the handsaw. You know this because you should store all tools safely
   - a. when using the tools on any metal surface
   - b. when using any handsaw
   - c. with any sharp edges pointing upward, not downward
   - d. while you are using them

5. The tools left on the overhead pipes are not stored properly. Why?
   - a. The tools cannot be reached by someone who needs them before lunch
   - b. The tools are not in a safe place
   - c. The tools are not within reach of your hand
   - d. The tools should be carried by the worker at all times

6. The worn tools should be removed from service. You could find these worn tools if you

    a. inspect all stored tools often
    b. inspect all stored tools once each year
    c. inspect all stored tools after any tool causes an accident
    d. use the tool and discover that it does not work properly

HAND TOOLS
SELF-TEST 2

1. Hold the hammer near

   a. the top of the handle
   b. the end of the handle
   c. the middle of the handle
   d. any spot on the handle

2. Never strike a

   a. mushroomed tool
   b. metal tool
   c. new tool
   d. lightweight tool

3. Wear safety goggles when using a hammer

   a. with any tool
   b. to strike another hammer face
   c. with a striking tool
   d. to strike a mushroomed tool

Read the paragraph below before answering the questions that follow --

You have had problems with glancing hammer blows all morning. You decide not to risk hitting your other hand with the hammer, and remove your safety goggles for a better view. After checking the hammer for a tight handle, you immediately swing the hammer and strike the chisel with the side of the hammer.

4. You might get a better view of the job by removing your safety goggles, but you are increasing your chances for personal injury at the same time because

   a. you are not using the right hammer for the job
   b. you are not wearing safety goggles when using a hammer with a striking tool
   c. you are still using a defective striking tool
   d. all of the above

5. If you have checked the hammer for a tight handle, why should you be concerned with the way you use the hammer afterward?

   a. You should check the immediate area for people and obstructions before swinging the hammer
   b. You should strike hammer blows squarely with the face of the hammer
   c. Both (a) and (b)
   d. You should never use a hammer with a striking tool

HAND TOOLS
SELF-TEST 3

1. Keep the blade or bit of all screwdrivers

   a. rounded-off
   b. oiled
   c. square-edged
   d. uneven

2. Clean off handles of screwdrivers

   a. after every use
   b. when told to do so
   c. if time allows
   d. only before storing the screwdriver
   e. none of the above

Read the paragraph below before answering the questions that follow --

You have just returned from a safety training program about "Safety with Hand Tools." At your work area, you need a crowbar but cannot find one. A co-worker is busy using a screwdriver. Because the screw will not fit easily, the co-worker holds the screw itself with one hand, while turning hard on the screwdriver with the other hand. You ask for the screwdriver to use instead of a crowbar, but your co-worker tells you not to use any screwdriver for your job.

3. You should correct your co-worker because

   a. the screw itself must be defective, even though the co-worker's procedure is correct
   b. a hammer should be used instead of a screwdriver, to make the screw fit
   c. your co-worker should not hold the screw after it is in place
   d. you should hold the screw while your co-worker turns hard on the screwdriver

4. Your co-worker correctly turns you down because

   a. you should keep the blade or bit of all screwdrivers square-edged
   b. you should use the right screwdriver for the job
   c. you should not expose screwdrivers to extreme heat
   d. you should not use any screwdriver to pry objects

HAND TOOLS
SELF-TEST 4

1. A socket wrench is used

    a. to apply force in one direction only
    b. to apply force in more than one direction
    c. to work on pipes and rods
    d. as a general purpose wrench
    e. none of the above

2. Do not expose wrenches to

    a. excessive cold
    b. excessive heat
    c. excessive use
    d. excessive periods of storage

3. With adjustable wrenches, you should apply force on the

    a. adjustable jaw
    b. fixed jaw
    c. adjustable or fixed jaw
    d. weaker jaw

Read the paragraph below before answering the questions that follow --

You have to remove a nut, but cannot find a wrench that fits tightly. You decide to use an adjustable wrench. After trying to remove the nut for a few minutes, you stop because the nut will not budge. For better leverage, you pick up a steel pipe and slide the pipe over the handle of the wrench. After making sure that the wrench fits tightly on the nut, you carefully pull on the pipe, being careful to apply force on the adjustable jaw of the wrench.

4. The pipe is an "extender" or "cheater" and

    a. should be used only when necessary for better leverage
    b. should be used to apply force on the fixed jaw only
    c. should not be used on any wrench handle
    d. should be used only if pulled toward you

5. A co-worker stops by to help, and tells you to stop. Your co-worker knows that you should apply force

    a. in an upward direction only
    b. in a downward direction only
    c. on the fixed jaw only
    d. on the adjustable jaw only

HAND TOOLS
SELF-TEST 5

Match the uses on the left with the right type of pliers on the right. (Answers can be used more than once.)

____ 1. For deeper reach into work area

____ 2. For locking at any size with the needed amount of pressure

____ 3. For using a wide range of jaw openings

____ 4. When heavy pressure is needed

____ 5. Should not be used as a wrench for removing nuts

____ 6. For holding an object that is hard to hold with your hands

a. Locking

b. Long nose

c. Combination

d. Adjustable

Answer the following questions TRUE or FALSE. (Circle T or F)

7. You should twist the pliers when cutting T F

8. You should oil pliers as needed T F

9. You should use the right type of pliers for the job T F

10. You should extend the handle with "extenders" or "cheaters" if needed T F

HAND TOOLS
SELF-TEST 6

Match the numbered uses of each file with the diagram of the file.

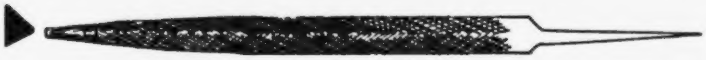
____ 1. Draw filing

____ 2. Filing crosscut saws with M-shaped teeth

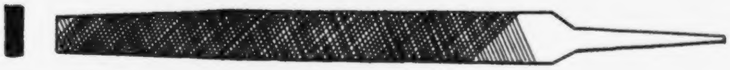
____ 3. Used on concave, convex, and flat surfaces

____ 4. Clearing-out square corners

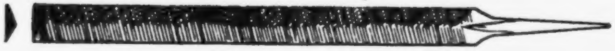
a.



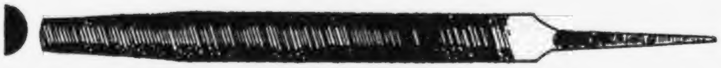
b.



c.



d.



HAND TOOLS
SELF-TEST 7

1. If a file does not have a secure handle, you should

   a. not use the file
   b. use the file with clamped work only
   c. use the file with long, even strokes only
   d. use the file on flat surfaces only

2. Clean all files

   a. by gently striking the file against another object
   b. by tapping the file on a tabletop
   c. by washing the file in clean water
   d. with a file-cleaning card only

3. Hold the file handle securely in one hand and guide the point of the file with

   a. with the thumb of your other hand
   b. with the index finger of your other hand
   c. with the thumb and index finger of your other hand
   d. with all of the fingers of your other hand

Read the paragraph below before answering the questions that follow --

A new employee is draw filing with a flat file. As you watch for a minute, the employee pushes the file forward and bears down on the file on the return stroke. The pressure applied on the file causes the work to slide, and the employee must adjust the work after every stroke. The employee sometimes uses the file for prying. You decide to offer some good advice.

4. You explain that the file will wear out quickly unless the employee

   a. releases pressure on the forward stroke
   b. increases pressure on the return stroke
   c. releases pressure on the return stroke
   d. increases pressure on the forward and the return stroke

5. You show that the work should be

   a. clamped in a vise at about waist-height
   b. held by the employee's other hand while filing
   c. held by another employee while filing
   d. replaced with a piece of work that will not slide

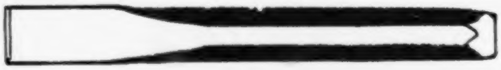
6. The employee learns that a file should not be used to

   a. hammer an object
   b. pry an object
   c. hammer or pry an object
   d. file work that is clamped in a vise

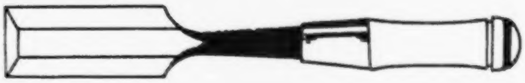
HAND TOOLS
SELF-TEST 8

Write the name of each chisel in the space beside each diagram.

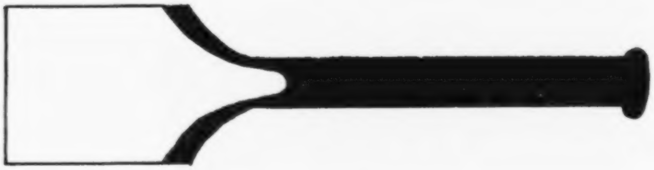
1. ______________



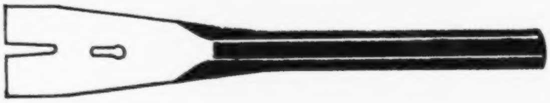
2. ______________



3. ______________



4. ______________



HAND TOOLS
SELF-TEST 9

1. You should use the right

   a. chisel for the job
   b. hammer for the job
   c. both (a) and (b)
   d. none of the above

2. The head of any chisel must be

   a. properly beveled
   b. mushroomed
   c. bent slightly
   d. oiled before each use

Read the paragraph below before answering the questions that follow --

Your safety supervisor gives you the opportunity to write some general safety rules for your work area. While looking through an old safety manual, you find these rules for using chisels:

Rule 1: "Be careful when using any chisels that are bent, cracked, or chipped"
Rule 5: "Chisels used to pry objects or used as wedges should be separated from other chisels in your work area"

3. You decide to revise Rule 1, because you know that any chisel that is bent, cracked, or chipped should be

   a. used only with proper personal protective equipment
   b. used only by qualified persons
   c. thrown away
   d. used with a mallet-type hammer only

4. You decide to revise Rule 5, because you know that

   a. chisels can be stored together, no matter how they are used
   b. chisels used for prying cannot also be used as wedges
   c. chisels should not be used as wedges, but can be used for prying
   d. chisels should not be used to pry objects or as a wedge

HAND TOOLS
SELF-TEST 10

Match the uses on the left with the right type of handsaw on the right.

____ 1. Cut metal

____ 2. Cut inside corners, curves, circles, and frets

____ 3. Cut with the grain of wood

____ 4. Cut across the grain of wood

____ 5. Shape ends of molding and trim for joints

a. Coping saw

b. Crosscut saw

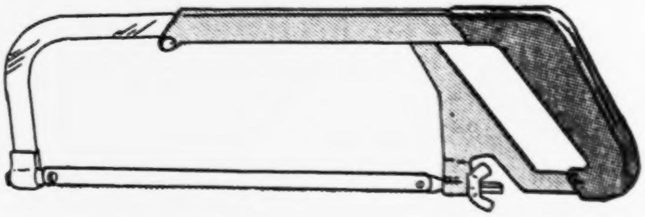
c. Ripsaw

d. Compass saw

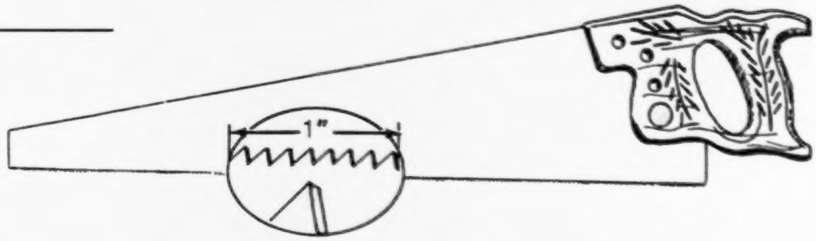
e. Hacksaw

Write the name of each handsaw in the space beside each diagram.

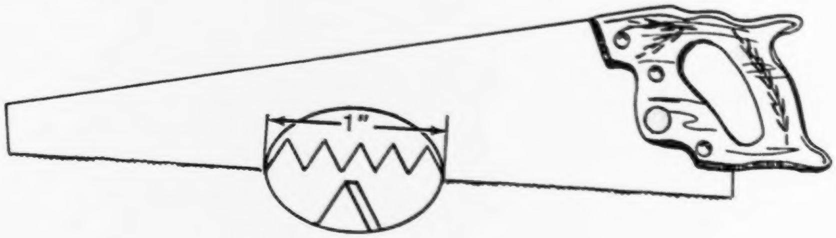
6. ________________



7. ________________



8. ________________



HAND TOOLS
SELF-TEST 11

1. Check the cutting material for nails and any other metal

   a. before cutting
   b. after cutting
   c. while cutting
   d. if time allows

2. You should support

   a. one end of the cutting material
   b. both ends of the cutting material
   c. the cutting material at the point of the cut only
   d. the handsaw only

3. Rest the saw blade on the edge of the material

   a. to start the cut
   b. to end the cut
   c. only when you are tired
   d. only when the saw blade becomes stuck

Read the paragraph below before answering the questions that follow --

You are finishing a job using a crosscut saw, doing the job the same way at work as you would at home in your garage. Carefully, using your index finger as a guide, you cut a groove in the material. After the cut is started, you cut with short, quick strokes and apply force lightly on the downward and the return strokes. After all, you don't have all day! Your safety supervisor sees you at work and asks you to stop.

4. Your supervisor reminds you that when you start a cut, you should

   a. use your index finger as a guide
   b. use your middle finger as a guide
   c. use your thumb as a guide
   d. use your entire hand as a guide

5. After starting the cut, you should cut with

   a. short strokes
   b. long strokes
   c. a combination of short and long strokes
   d. either long or short strokes

6. You remember that force should be lightly applied

   a. on the downward stroke
   b. on the upward stroke
   c. only if the blade bends in the cut
   d. only when starting the cut

HAND TOOLS
SELF-TEST 12

1. When using a compass saw, hold the cutting material

   a. if convenient to do so
   b. loosely
   c. securely
   d. only to remove the saw blade if it bends in the cut

2. If one hand holds the cutting material, in which direction should you cut with a compass saw?

   a. toward the hand holding the cutting material
   b. away from the hand holding the cutting material
   c. in either direction
   d. in both directions

3. If you force the saw blade of a compass saw into the cut, you could

   a. bend the saw blade
   b. break the saw blade
   c. bend or break the saw blade
   d. finish the job faster

4. When using a coping saw, support the cutting material with

   a. a vise only
   b. a vise and a saddle only
   c. a vise or a vise and a saddle
   d. none of the above

5. With a vise support,

   a. pull the saw gently up and down
   b. push the saw gently back and forth
   c. both (a) and (b)
   d. none of the above

6. With a vise and saddle support,

   a. pull the saw gently up and down
   b. push the saw gently back and forth
   c. both (a) and (b)
   d. none of the above

7. You should cut using

   a. short strokes
   b. full strokes
   c. both short and full strokes
   d. forward strokes only, lifting the blade out of the cut on the return stroke

8. While cutting, the blade starts to bind. You try to force the cut, and the blade breaks. You forgot that coping saw blades

   a. are thin
   b. can break easily
   c. both (a) and (b)
   d. will not break if lightly oiled

HAND TOOLS
SELF-TEST 13

1. When you clamp the cutting material in a bench vise before using a hacksaw, how much overhang should you leave?

   a. about 3 inches
   b. about 4 inches
   c. about 5 inches
   d. about 6 inches

2. Hold the saw firmly

   a. by the handle only
   b. by the front of the frame only
   c. by the handle and the front of the frame
   d. none of the above

3. Check the hacksaw for

   a. a tight blade
   b. sharp teeth
   c. correct direction of teeth (away from you)
   d. all of the above

Read the paragraph below before answering the questions that follow --

You are watching a co-worker at work using a hacksaw. Lying on her back, the worker is cutting a section of pipe above her. She has removed her safety goggles to get a better view of the job. Without decreasing her pressure on the cut, your co-worker reaches the end of the cut. Suddenly, she cuts her hand.

4. By removing her safety goggles, your co-worker has created an unsafe situation for her eyes by not using the right kind of

   a. safety goggles
   b. face shield
   c. personal protective equipment
   d. saw blade

5. Your co-worker could have helped to prevent the injury to her hand. When reaching the end of the cut, she forgot to

   a. ease up on the pressure
   b. apply more pressure
   c. apply a steady pressure
   d. use shorter, quicker strokes

HAND TOOLS
SELF-TEST 14

1. Face the ladder when climbing

   a. up
   b. down
   c. up and down
   d. near a door or other opening

2. How many persons should be on the ladder at a time?

   a. 1 person
   b. 2 persons
   c. 3 persons
   d. as many persons as needed for the job

3. If the distance from the base of a ladder to the top support is 16 feet, how far should the base of the ladder extend from the building?

   a. at least 1 foot
   b. at least 2 feet
   c. at least 3 feet
   d. at least 4 feet

4. Where should the ladder be tied-off?

   a. at the top only
   b. at the base only
   c. at the top and the base
   d. No tie-off is needed

5. You should not over-extend your reach

   a. while on the higher rungs of a ladder
   b. while on the lower rungs of a ladder
   c. while on a ladder
   d. when reaching further than 3 feet

6. A co-worker doing some electrical wiring chooses an aluminum ladder, since it is lighter than the wood ladder. Why is this a dangerous choice?

   a. Metal ladders should be clear of electrical hazards
   b. Electrical wiring jobs should not be done with any ladder
   c. The heavier the ladder, the better
   d. None of the above

HAND TOOLS
ANSWERS TO SELF-TESTS

NOTE: Check the appropriate pages in this unit for more information or explanations.

SELF-TEST 1

1. a; 2. c; 3. b; 4. d; 5. b; 6. a

SELF-TEST 2

1. b; 2. a; 3. c; 4. b; 5. c

SELF-TEST 3

1. c; 2. a; 3. c; 4. d;

SELF-TEST 4

1. a; 2. b; 3. b; 4. c; 5. c

SELF-TEST 5

1. b; 2. a; 3. d; 4. d; 5. c; 6. c; 7. F; 8. T; 9. T; 10. F

SELF-TEST 6

1. b; 2. c; 3. d; 4. a

SELF-TEST 7

1. a; 2. d; 3. c; 4. c; 5. a; 6. c

SELF-TEST 8

1. cold chisel; 2. wood chisel; 3. stripping chisel; 4. ripping chisel

SELF-TEST 9

1. c; 2. a; 3. c; 4. d

SELF-TEST 10

1. e; 2. d; 3. c; 4. b; 5. a; 6. hacksaw; 7. crosscut saw; 8. ripsaw

SELF-TEST 11

1. a; 2. b; 3. a; 4. c; 5. b; 6. a

ANSWERS TO SELF-TESTS

SELF-TEST 12

1. c; 2. b; 3. c; 4. c; 5. b; 6. a; 7. b; 8. c

SELF-TEST 13

1. d; 2. c; 3. d; 4. c; 5. a

SELF-TEST 14

1. c; 2. a; 3. d; 4. c; 5. c; 6. a

5 5 5 5 5 5 5 5

Power Tools and Machines

Power Tools and Machines

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Power Tools and Machines

INSTRUCTOR'S GUIDELINES

OBJECTIVE: The objective of this presentation is to instruct participants in the safe operation of common power tools and machines. Discuss the safety guidelines presented in this unit as supplemental safety rules. Participants should always follow all necessary OSHA guidelines and the manufacturer's instructions for proper use and safety.

1. USE this unit as a source of supplemental safety training in power tools and machine safety
2. ORDER or OBTAIN supplemental training materials for your presentation
    a. Films and videotape
        (1) Safety in the Shop: Power Tools. 13 minutes, Coronet Film and Video, 1971. Available for purchase from Coronet Film and Video, 108 Wilmot Road, Deerfield, Illinois 60015-9925 (Also available on videotape)
        (2) Working with Machinery. Color, 17 minutes, VHS. Available from AIMS Media, 6901 Woodley Avenue, Van Nuys, CA 91406-4878, or toll-free at (800) 367-2467
        (3) Take Two for Safety (Individual tapes in a series). Available from Du Pont Safety Services. For more information, call 1-800-532-SAFE
    b. Written materials
        (1) 29 CFR 1910 of the OSHA General Industry Safety and Health Standards -- Selected sections as needed
        (2) Accident Prevention Manual for Industrial Operations--Engineering and Technology (Current Edition), from the National Safety Council

        For current catalog, write or call the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois, 60611 or 1-800-621-7619; or contact the Oklahoma Safety Council, P.O. Box 14686, Oklahoma City, Oklahoma 73113 or (405) 848-8626

        (3) Best's Safety Directory (Current Edition), from the A.M. Best Company, Ambest Road, Oldwick, NJ 08858, or call (201) 439-2200

(4) Tool catalogs for the power tools used at your job site

(5) Safety posters, available from the National Safety Council in their Poster Directory (Current Edition)

See the address and phone number listed under (2)

c. Chalkboard, flip chart, chalk, marking pens, etc.

3. SHOW samples of power tools for the discussion of each tool

HINT: The tools should be those actually used at your job site.

4. TOUR a shop area with your participants, as needed, to demonstrate proper tool and machine layout and use

HINT: You might find it easier to train groups of employees who use the specific power tools and machines in their work areas. Train groups of employees who all use the same tools and machines on the job. Because these employees would be familiar with the tools and the layout of the tools and machines, you would not have to tour the shop areas to demonstrate the use and layout of those tools and machines.

5. EMPHASIZE the importance of following the manufacturer's instructions for proper use and safety with any power tool and machine

6. ASK participants about the role of each power tool and machine (discussed in this unit) at their work area:

a. What operations involve the tool or machine?
b. How do they monitor the use of each tool and machine?
c. Are safety rules posted for each tool or machine?
d. Do they have any tools or machines that they have not been trained to use, or on which they would like review training?

7. EXPLAIN or REVIEW your company's safety policies or guidelines for each power tool or machine, as you discuss each one

8. DEMONSTRATE and ask participants to demonstrate the safe way to handle each power tool, if possible

HINT: You could ask participants to demonstrate the safe way to handle each tool before you discuss the general safety rules for that tool, as a kind of "pre-test" to find out what participants already know about safety with each tool. Other participants could also evaluate each demonstration, before you discuss the general safety rules.

INSTRUCTOR'S GUIDELINES

Causes of Accidents with Power Tools and Machines

1. DISCUSS the common causes of accidents

2. EMPHASIZE the fact that most accidents are caused by human failure, not equipment failure

   HINT: This fact shows how valuable preventive safety training can be to any business, large or small.

3. INVITE persons involved in accidents with power tools and machines to discuss their experiences

POWER TOOLS AND MACHINES

CAUSES OF ACCIDENTS WITH POWER TOOLS

HUMAN FAILURE -- 88%

Using the wrong tool for the job

Using the right tool in the wrong way

Using a defective tool in any way

HAZARDOUS EQUIPMENT -- 10%

PURE ACCIDENT -- 2%

INSTRUCTOR'S GUIDELINES

Glossary

1. DISCUSS the terms and definitions
2. ADD terms and definitions that apply to your job site

POWER TOOLS AND MACHINES

GLOSSARY

1. Bevel -- Slant or incline on a surface
2. Booster -- Powder load used to project fasteners in powder-actuated tools
3. Chamfer -- Edge of a board beveled at a 45-degree angle
4. Dado -- Rabbet or groove cut in wood
5. Kickback -- Sharp, violent reaction of a tool as it rejects material being forced into it
6. Pocket Cut -- Inside cut that removes a middle section of the stock
7. Push Stick -- Safety device used to push material through cutters, to protect the user's fingers from being cut
8. Rabbet -- Groove cut in surface or edge of a board to receive another board that has a similar cut
9. Relief Cut -- Cut in stock that keeps the blade from binding
10. Resawing -- Cutting thick pieces of stock to make two or more thinner pieces

INSTRUCTOR'S GUIDELINES

General Safety Rules

1. For each rule, GIVE examples of accidents that could happen when the rule is not followed

   NOTE: Your examples should apply to your job site and to specific work areas at your job site.

2. DISCUSS each of the General Safety Rules

   Rule 1 State that safety rules will not help prevent accidents on the job if employees do not pay attention at all times

   Rule 2 Discuss the possible hazards of using the wrong kind of adapter or overloading an adapter

   Rule 3 Emphasize the importance of checking power tools and machines for worn or damaged parts before using the tool or machine

   Show examples of worn or damaged parts, if possible

   Rule 4 Explain what could happen if lock-on switches, keys, and adjusting wrenches are not removed before starting the tool

   Rule 5 Show examples of proper protective equipment

   Rule 6 Explain what could happen if hands, clothing, or jewelry become caught in a moving part

   Rule 7 Explain the hazards of electricity and wet surfaces

   Rule 8 Explain what could happen if the tool is left running

   Emphasize the CAUTION

   Rule 9 State that proper storage of power tools and machines should be part of a complete housekeeping program for all affected work areas

   HINT: Ask participants about the types of power tools used in their work areas, then emphasize those types of power tools, machines and safety guidelines throughout your presentation of the sections that follow.

POWER TOOLS AND MACHINES

GENERAL SAFETY RULES

1. KNOW how to use the tool correctly before using any power tool

   NOTE: You must also pay attention at all times while using any power tool.

2. GROUND all power tools before using them

   NOTE: Never remove the 3rd prong on a power cord. If the outlet will not accept a 3-pronged cord, use an acceptable adapter.

3. REPLACE any damaged or worn parts and power cords before using a tool

4. REMOVE all lock-on switches, keys, and adjusting wrenches before starting the tool

   NOTE: Remove switches, keys, and wrenches that are designed to be removed before starting the tool.

5. WEAR the proper type of protective equipment

6. KEEP your hands and clothing away from any moving parts of the tool at all times

   NOTE: Remove any jewelry before using a power tool.

7. DO NOT USE a power tool on or near a wet surface

8. TURN OFF and UNPLUG the tool before adjusting the tool or changing any attachments

   CAUTION: NEVER LEAVE A RUNNING TOOL UNATTENDED.

9. STORE the tool properly after using it

INSTRUCTOR'S GUIDELINES

Types of Power Tools and Related Hazards

1. DISCUSS each type of power tool and the hazards of each

2. ASK participants to explain how each hazard could lead to an accident

3. ASK participants for other examples of hazards for each type of tool

   HINT: Ask for specific examples of hazards with power tools and machines from their work areas.

4. USE the chart as a transparency or a wall chart throughout your presentation

   HINT: You can refer to the hazards for each type of tool, as a part of your discussion of each tool and machine.

POWER TOOLS AND MACHINES

TYPES OF POWER TOOLS AND RELATED HAZARDS

NOTE: This list is not complete.

Type	Hazards
Electric Tools	Electric shock, electrocution
	Burns, bruises, abrasions or scrapes
	Hazards from moving parts -- cuts, lacerations (jagged wounds), punctures, flying objects, entanglement in moving parts, etc
Pneumatic Tools (Air-Powered)	Hazards from force of projectiles such as staples, nails, etc
	Flying objects stirred by air pressure
	Entanglement caused by punctured air hose or hose not properly stored
	Hazards from moving parts
Gasoline-Powered Tools	Fumes from gasoline, exhaust, etc
	Fire hazards and explosion hazards
	Hazards from moving parts
Powder-Actuated Tools	Hazards from force of projectiles (fasteners)
	Flying objects stirred by force of explosion
	Fire hazards and explosion hazards -- can ignite flammable vapors

INSTRUCTOR'S GUIDELINES

Circular Saw Blades -- Types and Uses

1. EXPLAIN that safety with circular saw blades includes using the right type of blade for the job
2. SHOW examples of each type of circular saw blade
3. DISCUSS the chart showing Unsafe Conditions and Solutions
4. SHOW examples of saw blades that match the description for each unsafe condition, and HIGHLIGHT the solution to each condition

POWER TOOLS AND MACHINES

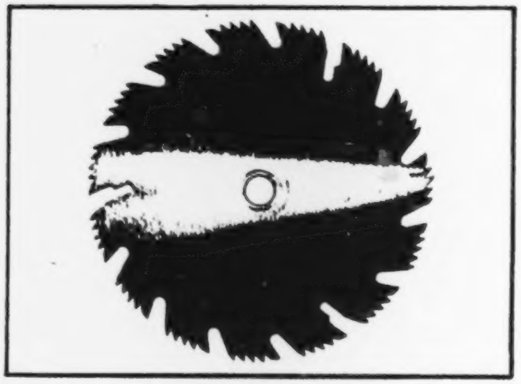
CIRCULAR SAW BLADES

Types and Uses

Master Combination Blade
(48 to 60 teeth)

Crosscutting, ripping, mitering, general purpose

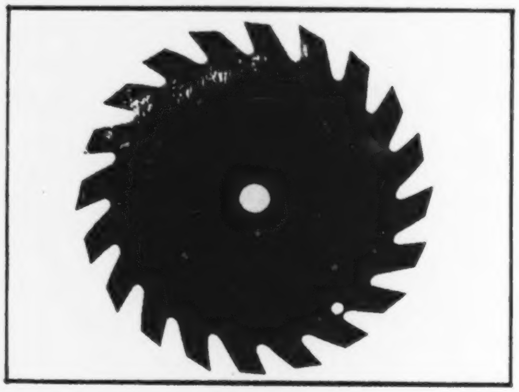
All-purpose blade for smooth, fast cutting



Chisel-tooth Combination Blade
(24 to 30 teeth)

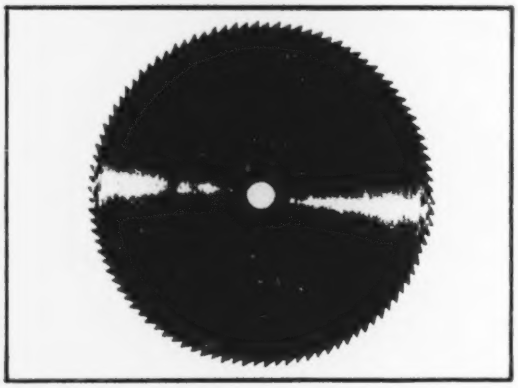
Crosscutting, ripping, mitering, general purpose

Free-cutting, general purpose blade for cutting in any direction



Combination Rip Blade
(36 to 44 teeth)

Crosscutting, ripping, mitering, general purpose

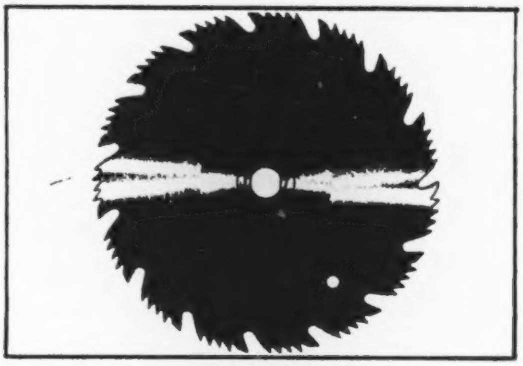


POWER TOOLS AND MACHINES

CIRCULAR SAW BLADES

Types and Uses

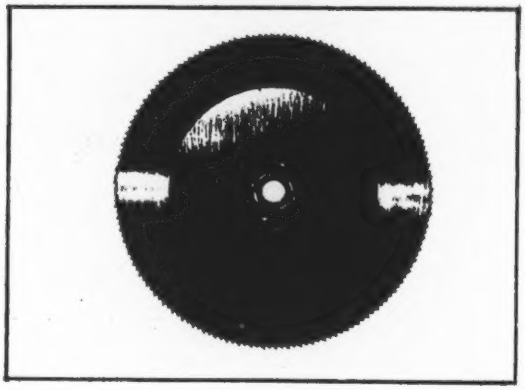
Hollow-ground Plane (Miter) Blade
(48 to 60 teeth)



Crosscutting, ripping
mitering, finish cabinet work

Makes smooth-finish cuts on all solid woods

Crosscut-flooring Blade
(10 to 100 teeth)



Crosscutting, mitering

General purpose, cut-off blade that is good for use on both hardwoods and softwoods

CIRCULAR SAW BLADES

Types and Uses

Unsafe Conditions and Solutions

Unsafe Condition	Description	Solution
Sawblade out of round	Saw is under unequal strain when some teeth are longer than others, causing saw to run out of line, heat up, and warp	Check sawblade for correct length of teeth
Sawblade not straight	Lumps or warps in blade	Check sawblade with a straightedge across length of diameter of the unmounted saw (blade may not be flat except when running)
Improper hook or pitch of teeth	Different sawblades are used for certain woods and wood material	Use correct type of sawblade for material being cut
Improper or uneven set	Sawblade not cutting a kerf thicker than the blade, needed for the saw to pass through the cutting material. A crack could also start	Bend alternate teeth right and left, or Spread the point of every tooth so each is slightly wider than the sawblade
Cracked blades	Cracks in sawblades, often starting in the gullets. Cracks often get larger and break apart	Remove cracked blades from use immediately Check blades for cracks when teeth are filed or set Tension blades for the correct speed used

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POWER TOOLS AND MACHINES

CIRCULAR SAW BLADES

Types and Uses

Unsafe Conditions and Solutions

Unsafe Condition	Description	Solution
Dull blades	Sawblades with dulled teeth. Dull blades make the saw and the operator work harder than necessary, and can start cracks	Keep sawblades sharp
Gummed blades	Pitch buildup on blades, which can cause a kickback	Keep sawblades clean and free of pitch buildup

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INSTRUCTOR'S GUIDELINES

Portable Power Saws -- Types and Uses

1. EXPLAIN that safety with portable power saws includes using the right type of saw for the job

2. SHOW examples of each type of saw, if possible

   HINT: Also show examples of or describe the right types of blades to use with each saw.

POWER TOOLS AND MACHINES

PORTABLE POWER SAWS

Types and Uses

Type	Uses
Circular saw	Ripping, crosscutting Making miter cuts, pocket cuts, bevel cuts
Reciprocating saw	Crosscutting Making irregular cuts, relief cuts, pocket cuts, inside curves and corner cuts
Jigsaw/Saber saw	Ripping, crosscutting Making relief cuts, pocket cuts, inside curves and corner cuts, scroll cuts
Band saw	Cutting pipe, angle iron, steel rods, metal studs

INSTRUCTOR'S GUIDELINES

Portable Power Saws -- General Safety Rules

1. DISCUSS each safety rule

   HINT: Refer to 29 CFR 1910.213 for more safety rules and guidelines for inspecting woodworking machinery.

2. SHOW examples of good (safe) cutting stock and bad (dangerous) cutting stock

   HINT: For the examples of bad cutting stock, explain why the stock is dangerous, and what could happen if the dangerous stock is used.

POWER TOOLS AND MACHINES

PORTABLE POWER SAWS

General Safety Rules

NOTE: Follow all OSHA guidelines.

Circular Saw

1. KEEP the power cord free of the blade, to avoid cutting the cord
2. BE SURE that the automatic guard is free and retractable

   CAUTION: NEVER LOCK THE AUTOMATIC GUARD IN THE RETRACTED POSITION.
3. CHECK the stock for nails and any other metal before cutting
4. USE a good, solid support for the stock while cutting
5. ALLOW the saw to reach maximum speed before starting the cut
6. SET the blade deep enough to cut through the stock only
7. LAY the saw on its side after finishing the cut

   CAUTION: DO NOT PUT THE SAW DOWN UNTIL THE BLADE STOPS COMPLETELY.

Reciprocating Saw and Jigsaw

1. KEEP the power cord free of the blade, to avoid cutting the cord
2. USE the right blade for the job
3. DO NOT force the blade into the stock
4. KEEP your hands clear of the blade
5. CUT the stock slowly
6. TURN OFF the motor immediately after finishing the cut

POWER TOOLS AND MACHINES

PORTABLE POWER SAWS

General Safety Rules

NOTE: Follow all OSHA guidelines.

Band Saw

1. USE the right size blade to avoid breaking the blade
2. CHECK to be sure that enough light is available at the saw table (without glare)
3. GUARD the point of operation if possible
4. DO NOT force the blade into the stock
5. KEEP your hands away from the sawblade until you are sure that the saw is not running and is properly disconnected

   NOTE: You may not notice that the blade is still moving.

INSTRUCTOR'S GUIDELINES

Power Saws -- Types and Uses

1. EXPLAIN that safety with power saws includes using the right type of saw for the job

2. DISCUSS the uses of each type of saw -- refer to the Glossary if necessary to define terms

   HINT: Show examples of finished work that illustrates each of the different uses for each type of saw -- illustrate the different types of cuts possible with each saw.

POWER TOOLS AND MACHINES

POWER SAWS

Types and Uses

Type	Uses
Table saw	Ripping, crosscutting, mitering, rabbeting, dadoing, cutting molding
Radial arm saw	Ripping, crosscutting, mitering, rabbeting, dadoing, cutting molding
Table band saw	Ripping, sawing circles
	Making irregular cuts, relief cuts
Power miter saw	Crosscutting, cutting straight miters

INSTRUCTOR'S GUIDELINES

General Safety Rules -- Table Saw (Circular)

Rule 1 Show the correct position of the guard over the blade

Rule 2 Explain what could happen if someone is in the line of the blade

Rule 3 Show the correct position of the blade above the stock

Emphasize the CAUTION

Explain what could happen if someone reaches across the saw blade

Rule 4 Refer participants back to the discussion of blade types and uses, and the importance of using the right blade

Rule 5 Show examples of the different types of stock, and explain the reason for the guideline listed for each type

Rule 6 Explain what could happen if a rip fence or miter gauge is not used when needed

Demonstrate the correct way to clamp on a step block

Rule 7 Explain the hazards of tilting the blade without checking whether the tilted blade will still clear the stock

Rule 8 Show examples of stock with a straight edge, and stock without a straight edge

Explain what could happen if stock is used that does not have a straight edge

Rule 9 Give examples of accidents that could happen when sawing freehand

Emphasize the CAUTION

Rule 10 Emphasize this rule and the CAUTION

POWER TOOLS AND MACHINES

POWER SAWS

General Safety Rules

NOTE: Follow all OSHA guidelines.

Table Saw (Circular)

1. KEEP the guard over the blade while using the saw

2. STAND out of the line of the blade

   NOTE: Also keep your hands out of the line of the cut.

3. CHECK the blade so that it projects 1/8 inch or less above the stock before starting the saw

   CAUTION: NEVER REACH ACROSS THE SAW BLADE.

4. USE the correct blade for the job

5. HANDLE the stock carefully

   Narrow stock -- Use a push stick for ripping

   Wide or long stock -- Get help to support the stock

   Cylindrical stock -- DO NOT RIP on a circular saw

6. DO NOT RIP without a rip fence, or CROSSCUT without a miter gauge

   NOTE: Before cutting stock to length using a rip fence and miter gauge, clamp on a step block for clearance.

7. When the blade is tilted, CHECK to make sure the blade will clear the stock before starting the saw

8. BE SURE the stock has a straight edge before ripping

9. HOLD the stock against a gauge -- Never saw stock freehand

   CAUTION: SAWING FREEHAND CAN BE DANGEROUS FOR YOUR HANDS AND CAN FORCE THE STOCK OUT OF LINE, BINDING ON THE SAWBLADE.

10. NEVER BACK UP the stock while the blade is turning

    CAUTION: BACKING UP THE STOCK WHILE THE SAWBLADE IS TURNING CAN CAUSE A SEVERE KICKBACK.

INSTRUCTOR'S GUIDELINES

General Safety Rules -- Radial Arm Saws

Rule 1 Explain what could happen if the blade is not at the proper depth

Rule 2 Refer back to the discussion of blade types and uses, and the importance of using the right blade

Rule 3 Explain what could happen if someone is in the line of the blade

Rule 4 Explain the hazards of starting the cut before the saw has reached maximum speed

Rule 5 State that employees should not force any stock into the saw blade

Rule 6 Refer to the definition of "kickback," discuss how the guard prevents kickbacks, and show an example of the guard

Rule 7 Explain what could happen if the stock is fed in the direction of the blade rotation when ripping

Rule 8 Explain the hazards of forcing scrap wood into the blade

General Safety Rules -- Table Band Saw

Rule 1 Display different blade sizes and explain the use of each

Rule 2 Explain what could happen if the stock is fed too quickly

Rule 3 Refer to the Glossary for the definition of a "relief cut" and show an example of a relief cut

Explain when relief cuts are needed

Rule 4 Demonstrate how to properly adjust the saw guide

General Safety Rules -- Power Miter Saws

Rule 1 Show examples of stock that is oversized

Rule 2 Explain the hazards of sawing long stock without extra support

Rule 3 Explain the hazards of leaving the motor running

POWER TOOLS AND MACHINES

POWER SAWS

General Safety Rules

NOTE: Follow all OSHA guidelines.

Radial Arm Saws

1. SET the blade at the proper depth before starting the saw
2. USE the proper blade for the job
3. STAND out of the line of the blade
4. ALLOW the saw to reach maximum speed before starting the cut
5. LET the saw feed slowly when crosscutting heavy stock -- the saw will tend to feed itself
6. USE an antikickback guard when ripping

   NOTE: When ripping, do not feed or pull the stock too quickly. This could jam the saw.

7. FEED the stock against the direction of the blade rotation when ripping
8. DO NOT STOP the blade by forcing scrap wood into the blade

Table Band Saw

1. USE the proper size blade, to avoid breaking the blade
2. DO NOT FEED the stock too quickly
3. USE relief cuts when needed
4. ADJUST the saw guide before each cut

Power Miter Saws

1. DO NOT CUT oversized stock
2. GET HELP to support the end of long stock
3. TURN OFF the motor immediately after making the cut

INSTRUCTOR'S GUIDELINES

Power Saws -- Using a Push Stick and Push Block

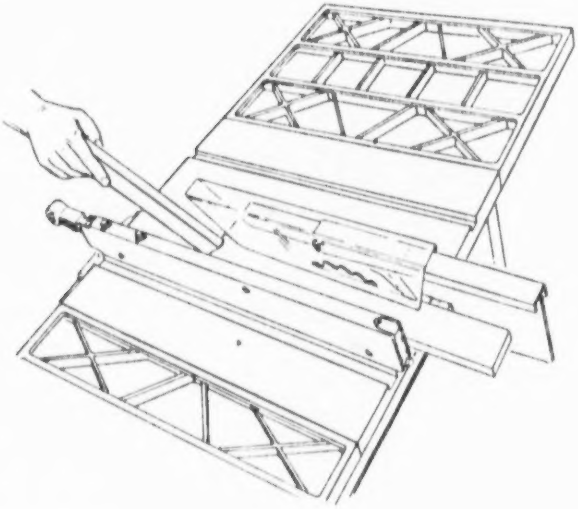
1. SHOW an example of a push stick and a push block (refer to the figures for the correct use)

POWER TOOLS AND MACHINES

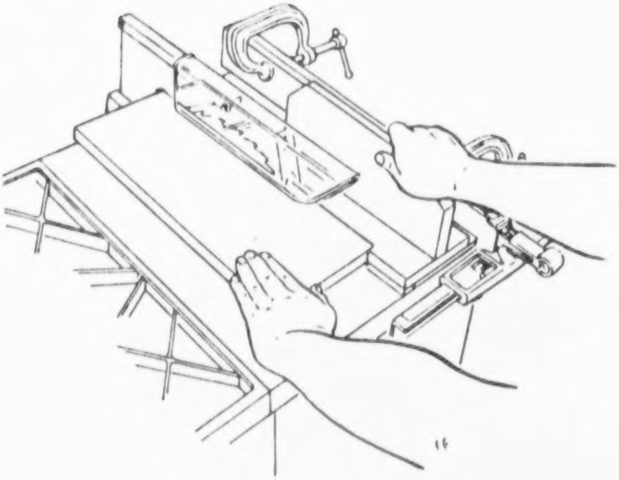
POWER SAWS

Using a Push Stick and Push Block

Push Stick



Push Block



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INSTRUCTOR'S GUIDELINES

Bench Grinders and Portable Angle Grinders -- Types and Uses

1. REFER to 29 CFR 1910, Sections 94, 215, and 243 for extra safety rules

2. DISCUSS the uses of bench grinders and portable angle grinders

   HINT: Give examples of how bench grinders and portable angle grinders are used at your job site, and in which work areas.

POWER TOOLS AND MACHINES

BENCH GRINDERS AND PORTABLE ANGLE GRINDERS

Types and Uses

NOTE: Follow all OSHA guidelines.

Bench Grinder

Sharpening tools

Grinding and shaping steel

Grinding burrs and rough spots from steel

Portable Angle Grinder

Rough sanding

Grinding metal, concrete

Polishing and buffing

Removing rust and scale from steel

Wire brushing

INSTRUCTOR'S GUIDELINES

General Safety Rules -- Bench Grinders

Rule 1	Explain what could happen if safety goggles are not worn
	Emphasize the NOTE
Rule 2	Discuss the purpose of the tool rest
	Explain what could happen if the tool rest is not used
	Emphasize the CAUTION
Rule 3	Describe the problems that could occur when wood or plastic is used
Rule 4	Show how to ring test a wheel, using a good and a bad wheel to show the difference
	Emphasize the CAUTION
Rule 5	Explain the hazards from forcing the stock into the grinding wheel
Rule 6	Explain the hazards of removing paint with a grinder

General Safety Rules -- Portable Angle Grinders

Rule 1	Explain what could happen if safety goggles are not worn
Rule 2	Describe cases where protective gloves are needed
Rule 3	Show examples of the different grinding heads and explain how to identify the correct grinding head for the material
Rule 4	Explain what could happen if the grinding head is still turning when the grinder is set down

POWER TOOLS AND MACHINES

BENCH GRINDERS AND PORTABLE ANGLE GRINDERS

General Safety Rules

NOTE: Follow all OSHA guidelines.

Bench Grinders

1. WEAR safety goggles at all times

   NOTE: Never wear gloves when using a bench grinder. The gloves could be pulled into the wheel.

2. USE a tool rest at all times

   CAUTION: NEVER SET THE TOOL REST WHILE THE WHEEL IS TURNING.

3. DO NOT USE for woods or plastics

4. RING TEST the wheel for a cracked or damaged wheel

   CAUTION: STAND TO ONE SIDE OF THE WHEEL UNTIL IT HAS REACHED ITS FULL ROTATING SPEED.

5. DO NOT FORCE the stock into the grinding wheel

6. DO NOT REMOVE paint with the grinder

Portable Angle Grinders

1. WEAR safety goggles at all times

2. WEAR protective gloves when needed

3. USE the proper grinding head for the material being ground

   EXAMPLE: Head for steel, head for concrete, etc.

4. CHECK to be sure the grinder head has stopped before laying the grinder down

INSTRUCTOR'S GUIDELINES

Grinding Wheels

1. DISCUSS each of the rules (and the NOTEs)
2. SHOW examples of grinding wheels, mounting flanges, and paper blotters, if possible
3. EXPLAIN what could happen if each rule is not followed

POWER TOOLS AND MACHINES

GRINDING WHEELS

NOTE: Follow all OSHA guidelines.

1. RING TEST all grinding wheels before mounting each wheel

   NOTE: Each wheel should have a clear sound.

2. HANDLE all grinding wheels carefully

   NOTE: Use rubber hose or hoist cables when handling large wheels.

3. STORE all straight wheels upright

   STORE all cup, dish, and saucer wheels flat with cardboard between layers

4. USE the right wheel for the material and the type of grinding required

5. USE mounting flanges of the correct diameter and in good condition

   NOTE: Proper mounting flanges will apply even pressure to the sides of the wheel.

6. USE paper blotters on both sides of the wheel

   NOTE: Paper blotters will help make sure that pressure from the mounting flanges is applied evenly to the sides of the wheel.

7. TIGHTEN the mounting nut only enough to keep the wheel from slipping

   NOTE: Too much tightening may crack the wheel.

8. NEVER FORCE a grinding wheel onto a machine spindle

9. RESET the tool rest, spark deflector, and face shield before starting the grinder

   NOTE: Rotate a new wheel by hand, to check for proper clearance between the wheel and the tool rest.

INSTRUCTOR'S GUIDELINES

Woodworking Lathe

1. EXPLAIN the parts of a woodworking lathe

2. DISCUSS each of the General Safety Rules

Rule 1	Show examples of proper eye protection Explain what could happen if loose clothing, hair, and jewelry is not confined Emphasize the NOTE
Rule 2	Show examples of good stock and bad stock for a woodworking lathe Explain what could happen if poor stock is used
Rule 3	Explain what could happen if the tool rest is adjusted while the lathe is in motion Emphasize the CAUTION
Rule 4	Describe the right speed for different material sizes and hardnesses
Rule 5	Explain the hazards of using tools that are not sharp or that have handles that are not secure Show examples of lathe turning tools
Rule 6	Explain why this rule is important
Rule 7	Explain what could happen if tools are on the bed when the lathe is in motion Emphasize the CAUTION
Rule 8	Explain the types of accidents that the safety shield can help prevent
Rule 9	Explain why this rule is important
Rule 10	Discuss why sanding operations do not require the tool rest

POWER TOOLS AND MACHINES

LATHES

NOTE: Follow all OSHA guidelines.

Woodworking Lathe

1. WEAR the proper type of eye protection and CONFINE all loose clothing, hair, and jewelry

   NOTE: Wear a face shield with your goggles, especially to protect against dust and chip hazards.

2. CHECK the stock for soundness and proper centering. DO NOT USE stock that is cracked, split, or has knots

3. ADJUST the tool rest before starting the lathe. REVOLVE the stock by hand before starting the lathe, to be sure that it can run clear

   CAUTION: ALWAYS BE SURE THAT THE LATHE IS COMPLETELY STOPPED BEFORE YOU ADJUST THE TOOL REST.

4. USE the right speed for the diameter and hardness of the material

   NOTE: Work the stock at a slow speed until it begins to take shape.

5. USE the proper sharp tools for the operation

   NOTE: Be sure the tool handles are secure.

6. HOLD the lathe turning tool firmly against the tool rest

7. REMOVE all tools from the bed of the lathe before operating the lathe

   CAUTION: DO NOT ALLOW ANYONE TO STAND BEHIND THE LATHE WHILE IT IS OPERATING. LATHE TOOLS CAN BE CAUGHT BY THE WOOD AND THROWN IN THAT DIRECTION.

8. KEEP the safety shield in place at all times

9. KEEP the faceplate screws tight and USE the correct spindle speed

   NOTE: The faceplate mounts work or fixtures using bolts and clamps when the part cannot be held in a chuck or between centers.

10. REMOVE the tool rest for sanding operations

INSTRUCTOR'S GUIDELINES

Spinning Lathe

1. EXPLAIN the parts of a spinning lathe

2. DISCUSS each of the General Safety Rules

Rule 1	Explain what could happen if loose clothing, hair, and jewelry is not confined
Rule 2	Explain why this rule is important Emphasize the CAUTION
Rule 3	Show examples of proper eye protection
Rule 4	Explain what could happen if someone is not clear of the spindle nose
Rule 5	Explain the hazards of a spinning disc
Rule 6	Explain why this rule is important
Rule 7	Describe the correct tightness of each part
Rule 8	Show examples of different tools that can be used with a spinning lathe
Rule 9	Explain the hazards of forcing the material too quickly
Rule 10	Explain why this rule is important

POWER TOOLS AND MACHINES

LATHES

NOTE: Follow all OSHA guidelines.

Spinning Lathe

1. CONFINE any loose clothing, jewelry, and long hair
2. CHECK that all guards are in place and work properly

   CAUTION: BE SURE THAT THE POWER IS OFF BEFORE CHECKING THE GUARDS OR ANY OTHER PART OF THE LATHE.

3. WEAR the proper type of eye protection at all times

   NOTE: Wear a face shield also, if needed.

4. STAND CLEAR of the spindle nose in front of the spinning lathe
5. KEEP AWAY from a spinning disc
6. SET the tool rest no more than one inch (1") from the disc
7. SECURE the tool rest, the tool rest base, and the fulcrum pin before using the lathe

   NOTE: Tighten these parts as needed.

8. USE the right tool for the job
9. FORCE the material slowly to match the forming chuck
10. REMOVE the tool rest and the pin when using steel wool or when polishing

INSTRUCTOR'S GUIDELINES

Machine Lathe

1. EXPLAIN the parts of a machine lathe

2. DISCUSS each of the General Safety Rules

Rule 1 Show examples of proper eye protection

Rule 2 Explain why this rule is important

Rule 3 Give examples of accidents that could happen if the chuck key is not removed

Rule 4 Explain why this rule is important

Rule 5 Explain what could happen if the cutting tool is adjusted or the work is measured when the lathe is running

Rule 6 Describe the hazards of working with your left arm and your body too close to the lathe dog

Rule 7 Explain what could happen if the lathe is reversed without being fully stopped first

Rule 8 Explain why this rule is important

Rule 9 Discuss the importance of keeping the work and the lathe clean

Explain why cleaning should be done with a brush, not with the hands

POWER TOOLS AND MACHINES

LATHES

NOTE: Follow all OSHA guidelines.

Machine Lathe

1. WEAR the proper type of eye protection at all times

   NOTE: Also wear a face shield, if needed.

2. CLAMP the tail stock and adjust the tool rest before starting the lathe

3. REMOVE the chuck key before starting the lathe

4. With the power off, TURN the lathe by hand while attaching or removing a faceplate or chuck

5. ADJUST the cutting tool or MEASURE the work only when the lathe is not running

6. KEEP your left arm and your body a safe distance from the lathe dog

7. REVERSE the lathe only after it has fully stopped

8. REMOVE the tool bit from the holder when you take work from the lathe or when you change the chucks

9. BRUSH OFF any chips from the work and the lathe. Do not use your hands

INSTRUCTOR'S GUIDELINES

Drill Press

1. EXPLAIN the parts of a drill press

2. DISCUSS each of the General Safety Rules

Rule 1 Explain what could happen if loose clothing, hair, and jewelry is not confined

Rule 2 Show examples of proper eye protection

Rule 3 Explain the types of guards on a drill press and their function

Rule 4 Explain what could happen if the work is not secured

Rule 5 Discuss the hazards from leaving the key in the chuck

Rule 6 Explain why a sharp drill bit is important (and safe)

Show examples of sharp and dull drill bits

Explain how the operator of the drill press can identify problems with the drill bit

Rule 7 Explain what could happen if the table or the depth stop is not properly adjusted before using the drill press

Rule 8 Discuss the hazards of using the wrong speed

Rule 9 Explain what could happen if the drill is forced into the work

Emphasize the CAUTION

POWER TOOLS AND MACHINES

DRILL PRESS

NOTE: Follow all OSHA guidelines.

1. REMOVE all jewelry and PROTECT long clothing and long hair
2. WEAR the right type of eye protection
3. CHECK that all guards are in place and operate properly
4. SECURE the work with a vise or clamps
5. REMOVE the key from the chuck
6. CHOOSE a sharp drill bit

   NOTE: Center the punch where the hole will be drilled in metal.

7. ADJUST the table or the depth stop to avoid drilling into the table
8. USE the correct speed

   NOTE: Normally use a slower speed for metal than for wood. The larger the bit, the slower the speed.

9. DO NOT FORCE the drill into the work

   CAUTION: IF THE DRILL BECOMES CAUGHT, TURN THE DRILL PRESS OFF AND CHECK THE WORK AND THE DRILL BIT.

INSTRUCTOR'S GUIDELINES

Milling Machine

1. EXPLAIN the parts of a milling machine

2. DISCUSS each of the General Safety Rules

Rule 1	Show examples of the proper face shield, safety glasses, and goggles
	Explain what could happen if loose clothing, hair, jewelry, and gloves become caught in the milling machine
Rule 2	Describe ways to fasten the work
	Explain why a soft hammer or mallet is needed
	Explain what could happen if the work is not fastened securely
Rule 3	Explain why this rule is important
	Emphasize and explain the CAUTION
Rule 4	Describe the proper depth of cut
Rule 5	Describe the safe way to handle the cutters
Rule 6	Describe the correct speed
Rule 7	Explain why this rule is important
	Emphasize the NOTE
Rule 8	Describe the "right" direction
	Emphasize and explain the CAUTION
Rule 9	Explain why this rule is important
Rule 10	Discuss the importance of keeping the machine, the work, and the work area clean
	Explain why cleaning should be done with a brush, not with the hands
	Emphasize the CAUTION

POWER TOOLS AND MACHINES

MILLING MACHINE

NOTE: Follow all OSHA guidelines.

1. WEAR a face shield with safety glasses or goggles

   CAUTION: DO NOT WEAR LOOSE CLOTHING, JEWELRY, GLOVES, OR LONG HAIR AROUND A MILLING MACHINE.

2. FASTEN the work securely

   NOTE: Use only a soft hammer or mallet to seat the work against the parallels or the bottom of the vise.

3. CHECK that the work, the milling machine table, and any holding device clears the arbor and support

   CAUTION: NEVER ADJUST OR MEASURE THE WORK WHILE THE MACHINE IS RUNNING.

4. SET the machine for the proper depth of cut

5. HANDLE all cutters carefully

   NOTE: Use the right cutter for the job and be sure that the cutter is sharp.

6. CHOOSE the correct feed

   NOTE: Disengage the handles when using the automatic feed or when locking the table.

7. STAND to one side of the machine and CLEAR the table of any tools

   NOTE: Be sure that nobody else is inside the operator's zone.

8. CHECK that the cutter is turning in the right direction

   CAUTION: NEVER REACH AROUND THE CUTTER WHILE THE MACHINE IS RUNNING.

9. FEED against or opposite to the direction of the turning cutter

10. CLEAN the machine, the work, and the work area around the machine with a brush

    CAUTION: NEVER CLEAN A RUNNING MACHINE AND NEVER USE A RAG TO CLEAN THE TABLE WHILE THE CUTTER IS TURNING.

INSTRUCTOR'S GUIDELINES

Jointer

1. EXPLAIN the parts of a jointer

2. DISCUSS each of the General Safety Rules

Rule 1	Explain why this rule is important
Rule 2	Explain what could happen if the depth of the cut is adjusted after the jointer is turned on
Rule 3	Discuss the importance of the length and width of the stock
Rule 4	Describe how clamping screws are used
Rule 5	Explain the hazards of starting the cut before the jointer has reached maximum speed
Rule 6	Refer participants back to the diagram of the push stick and push block Show examples of narrow and flat pieces of stock that require a push stick or push block
Rule 7	Describe dangerous situations for hands and fingers, and show how to prevent dangerous situations
Rule 8	Refer to the definition of "kickback" in the Glossary, if needed
Rule 9	Explain why this rule is important

POWER TOOLS AND MACHINES

JOINTER

NOTE: Follow all OSHA guidelines.

1. GUARD the blades at all times

2. ADJUST the depth of the cut before turning the power on

3. USE stock that is longer than 12 inches and wider than 1 inch

4. SECURE the fence with clamping screws

5. ALLOW the jointer to reach maximum speed before starting the cut

6. USE a push stick or push block when jointing narrow or flat pieces of stock

7. PROTECT your hands and fingers. Keep fingers as high as possible, do not drag your thumb at the back of the stock, and change the position of your hands when passing work over the jointer

8. DO NOT CUT deeper than 1/8 inch

   NOTE: This will help prevent kickbacks.

9. FOLLOW-THROUGH with the stock and allow the guard to return to the closed position

INSTRUCTOR'S GUIDELINES

Metal Shears

1. EXPLAIN the uses of metal shears

   HINT: Give examples of how metal shears are used at your job site, and the work areas in which they are used.

2. DISCUSS each of the General Safety Rules

Rule 1	Describe the dangers of forcing the shears into the stock
Rule 2	Explain the importance of the thickness of the stock
Rule 3	State that metal stock usually has sharp edges

POWER TOOLS AND MACHINES

METAL SHEARS

1. DO NOT FORCE the shear into the stock
2. DO NOT CUT stock that is too thick
3. KEEP your fingers away from the sharp edges of the stock being cut

INSTRUCTOR'S GUIDELINES

Portable Drill, Screwdriver, and Hammer Drill -- Types and Uses

1. EXPLAIN the uses of each tool

   HINT: Give examples of how these drills are used at your job site, and the work areas in which they are used.

2. EXPLAIN the visible parts

POWER TOOLS AND MACHINES

PORTABLE DRILL, SCREWDRIVER, AND HAMMER DRILL

Types and Uses

Type	Uses
Portable Drill	Boring and drilling
	Cutting holes with hole saw
	Mixing materials
	Driving screws
Portable Screwdriver	Driving and removing wood screws, machine screws, thread-cutting screws, lag bolts
Portable Hammer Drill	Drilling holes in masonry, concrete, wood, and other materials
	Setting anchors
	Performing light chipping work
	Mixing materials

INSTRUCTOR'S GUIDELINES

General Safety Rules -- Portable Drill and Hammer Drill

Rule 1 Show examples of proper eye protection

Describe possible hazards to the eyes

Rule 2 Explain why this rule is important

Rule 3 Show examples of auger bits that are designed for a hand brace

Explain why this rule is important

Rule 4 Explain the dangers of stopping the drill this way

Explain how to properly stop the drill

Rule 5 Explain what could happen if the drill is forced into the stock

Emphasize the CAUTION and explain the dangers of small pieces of work that are not secured

Rule 6 Explain why this rule is important

Rule 7 Describe the dangers of pointing the drill at someone

Emphasize the CAUTION

General Safety Rules -- Portable Screwdriver

Rule 1 Show examples of screws and matching screw bits

Rule 2 Describe the dangers of placing the screw point against your body

Rule 3 Describe the possible results of failing to follow this rule

POWER TOOLS AND MACHINES

PORTABLE DRILL, SCREWDRIVER, AND HAMMER DRILL

General Safety Rules

NOTE: Follow all OSHA guidelines.

Portable Drill and Hammer Drill

1. WEAR the proper type of eye protection
2. REMOVE the chuck key before starting the drill

   NOTE: The chuck key locks the drill bit into the chuck.

3. DO NOT USE auger bits designed for a hand brace
4. DO NOT STOP the drill by holding the chuck
5. DO NOT FORCE the drill into the stock

   CAUTION: SECURE SMALL PIECES OF WORK TO HELP KEEP THEM FROM MOVING.

6. On deep cuts, BACK OUT the drill often to clear the hole
7. DO NOT POINT the drill at anyone

   CAUTION: NEVER HOLD AN ELECTRIC DRILL AGAINST ANY PART OF YOUR BODY.

Portable Screwdriver

1. USE the correct type and size bit for the screws being used
2. DO NOT PLACE the screw point against any part of your body
3. DO NOT HOLD your hand behind the material receiving the screw

INSTRUCTOR'S GUIDELINES

Pneumatic Nailer and Stapler

1. REVIEW the hazards of pneumatic tools

   HINT: Refer back to "Types of Power Tools and Related Hazards."

2. EXPLAIN the uses of pneumatic tools

   HINT: Give examples of how pneumatic tools are used at your job site, and the work areas in which they are used.

3. DISCUSS each of the General Safety Rules

Rule 1	Describe the hazards of using the wrong pressure
Rule 2	Explain why this rule is important for pneumatic tools State that a pneumatic tool must be handled properly and safely, just as any other tool
Rule 3	Show examples of nails and staples for different fasteners
Rule 4	Explain how to protect yourself against possible discharge when attaching the air supply
Rule 5	Explain why this rule is important
Rule 6	Discuss the hazards of using a pneumatic nailer or stapler for other purposes than the intended purpose
Rule 7	Describe what could happen if the tool is pointed at another person at any time
Rule 8	Describe the hazards of using fasteners on the wrong material Give examples of material that is too soft or too thin for fasteners

POWER TOOLS AND MACHINES

PNEUMATIC NAILER AND STAPLER

NOTE: Follow all OSHA guidelines.

1. USE only the pressure specified by the manufacturer
2. DO NOT LIFT any pneumatic tool by the power cord
3. USE only the nails and staples designed for the fastener being used
4. WATCH OUT for discharge when attaching the fastener to the air supply
5. KEEP your hands and body away from the discharge end of the fastener
6. DISCHARGE fasteners only when you are actually nailing or stapling
7. NEVER POINT fasteners at anyone, including yourself
8. DO NOT USE fasteners on soft or thin material that nails can go through

INSTRUCTOR'S GUIDELINES

Gasoline-Powered Tools

1. GIVE examples of common gasoline-powered tools used at your job site, and the work areas in which they are used

2. REVIEW the hazards of gasoline-powered tools

   HINT: Refer back to "Types of Power Tools and Related Hazards."

3. DISCUSS each of the General Safety Rules

Rule 1	Give examples of poor ventilation where gasoline-powered tools are used Give examples of proper ventilation where gasoline-powered tools are used
Rule 2	Explain the dangers of sparks near gasoline-powered tools Give situations where hand tools could be used in a way that presents a hazard around gasoline-powered tools
Rule 3	Explain the importance of this rule
Rule 4	Give situations where fuel could be likely to spill and create a hazard Emphasize the CAUTION

GASOLINE-POWERED TOOLS

NOTE: Follow all OSHA guidelines.

1. USE the tool only in a well-ventilated area

   NOTE: Gasoline fumes can be a health hazard.

2. NEVER LIGHT a match or create a spark around any gasoline-powered tool

   NOTE: Be careful when using tools around gasoline-powered tools. Wrenches, pliers, hammers, and other tools can be dropped and can cause sparks.

3. REFILL the fuel tank only after the tool has cooled down

4. CLEAN up any spilled fuel immediately

   CAUTION: FUEL LEFT ON THE FLOOR OR ON THE TOOL CAN BE A FIRE AND/OR EXPLOSION HAZARD.

INSTRUCTOR'S GUIDELINES

Powder-Actuated Tools -- Parts of a Powder-Actuated Tool

1. REVIEW the hazards of powder-actuated tools

   HINT: Refer back to "Types of Power Tools and Related Hazards."

2. EXPLAIN the uses of powder-actuated tools

   HINT: Give examples of how powder-actuated tools are used at your job site, and the work areas in which they are used.

3. EXPLAIN the parts of a powder-actuated tool

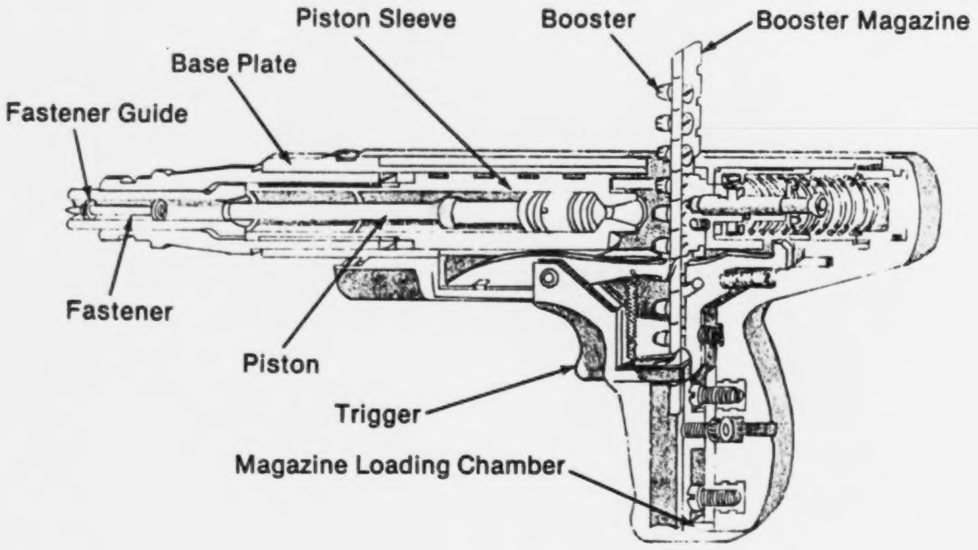
   HINT: State that the tool shown in the diagram is only one example and one brand of powder-actuated tool. Use the diagrams that apply to the tool used at your job site, if possible.

POWDER-ACTUATED TOOLS

Parts of a Powder-Actuated Tool

NOTE: This diagram is one example only.

NOTE: A powder-actuated tool is a semiautomatic, low-velocity fastening system operated by powder boosters.


Piston Sleeve
Booster
Booster Magazine
Base Plate
Fastener Guide
Fastener
Piston
Trigger
Magazine Loading Chamber

Adapted with permission of Hilti Fastening Systems, Tulsa, Oklahoma.

INSTRUCTOR'S GUIDELINES

Powder-Actuated Tools -- General Safety Rules

1. DISCUSS each of the General Safety Rules

Rule 1	Emphasize this rule
Rule 2	Show examples of correct safety goggles, hard hats, and hearing protection required
Rule 3	Display examples of pins and pin sizes Emphasize the CAUTION
Rule 4	Explain the types of boosters and the correct booster for the job Use a catalog from a powder-actuated tool manufacturer for examples of boosters and fasteners available
Rule 5	Describe the hazards of pointing the tool at someone or at yourself, even for a moment Emphasize the CAUTION
Rule 6	Explain what could happen if fasteners are driven into the wrong materials
Rule 7	Describe the hazards of using materials that can be easily penetrated Emphasize the CAUTION Give examples of the wrong way and the right way to select material and position it for fastening
Rule 8	Explain what could happen if the booster is pried out with any sharp instrument
Rule 9	State that all operators of powder-actuated tools must be certified and carry a safety certification card Emphasize the CAUTION Describe the dangers from leaving a loaded tool unattended

2. DISCUSS the requirements for safety certification

HINT: Contact manufacturers of powder-actuated tools and ask about their requirements for operators of their equipment.

POWER TOOLS AND MACHINES

POWDER-ACTUATED TOOLS

General Safety Rules

NOTE: Follow all OSHA guidelines.

BEFORE USING A POWDER-ACTUATED TOOL, YOU MUST BE CERTIFIED AND HAVE A SAFETY CERTIFICATION CARD.

1. FOLLOW all of the safety precautions according to the manufacturer's instructions
2. WEAR safety goggles, a hard hat, and the appropriate ear protection

   NOTE: Also use shields, guards, and attachments recommended by the manufacturer.
3. USE the proper pin size for the job

   CAUTION: LOAD THE TOOL ONLY WHEN YOU ARE READY TO USE IT.
4. USE the proper booster

   NOTE: Color codes are often used by the manufacturer to identify the proper booster for different jobs.
5. NEVER HOLD the end of the barrel against your body or cock the tool against your hand

   CAUTION: NEVER POINT A POWDER-ACTUATED TOOL AT ANYONE.
6. DO NOT DRIVE fasteners into very hard or brittle materials

   EXAMPLES: Cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick, hollow tile, etc.
7. AVOID driving fasteners into materials that can be easily penetrated unless the material is backed by a substance that will prevent the fastener from passing completely through the material

   CAUTION: NEVER PLACE YOUR HAND BEHIND THE MATERIAL THAT YOU ARE FASTENING.
8. DO NOT PRY the booster out of the magazine with any sharp instrument
9. DO NOT LEAVE the tool unattended

   CAUTION: NEVER LEAVE A LOADED TOOL UNATTENDED.

POWER TOOLS AND MACHINES

POWDER-ACTUATED TOOLS

General Safety Rules

NOTE: Follow all OSHA guidelines.

Requirements for Safety Certification*

1. COMPLETE a training program recognized by the manufacturer of the powder-actuated tool
2. DEMONSTRATE the ability to correctly use the powder-actuated tool
3. PASS a written test

---

*Refer to

(1) Powder-Actuated Tool Manufacturers' Institute, 100 S. Third Street, St. Charles, MO 63301. Basic Training Manual

(2) National Safety Council, 444 N. Michigan Avenue, Chicago, Illinois 60611. Powder-Actuated Hand Tools, Industrial Data Sheet 236

POWER TOOLS AND MACHINES
SELF-TEST 1

1. You should know how to use the tool correctly

   a. before using any power tool
   b. when an accident happens involving any power tool
   c. when any power tool does not work properly
   d. when you are told to do so

2. Before using a tool, you should

   a. replace any damaged parts
   b. replace any worn parts
   c. replace any damaged or worn power cords
   d. all of the above
   e. none of the above

3. Before starting the tool, you should

   a. remove all lock-on switches
   b. remove all keys
   c. remove all adjusting wrenches
   d. all of the above
   e. none of the above

Read the paragraph below before answering the questions that follow --

One of your co-workers must cut some small wooden pieces using a saber saw, in a remote area of the plant yard. It had rained the night before, and the yard is still damp. Your co-worker attaches an extension cord to the tool's power cord and gets ready to start, without paying attention to a small cut in the insulation on the extension cord . . .

4. Your co-worker's decision to use the saber saw in the plant yard is a mistake because

   a. the co-worker does not have permission to use the tool in the yard
   b. the co-worker is using the wrong type of power saw for the job
   c. the co-worker plans to use the tool on or near a wet surface
   d. the co-worker should never use the tool in the plant yard

5. The extension cord is dangerous because it should have been

   a. patched up
   b. replaced
   c. tagged
   d. stored properly

POWER TOOLS AND MACHINES
SELF-TEST 2

1. Some hazards of electric tools include

    a. electric shock
    b. burns, bruises, abrasions or scrapes
    c. hazards from moving parts
    d. all of the above
    e. none of the above

2. The engine of a certain gasoline-powered tool is hard to start. To avoid restarting the tool, a co-worker starts to pour in fuel while the engine is still running. Which hazards of gasoline-powered tools are present in this situation?

    a. Fire and explosion hazards
    b. Hazards from force of projectiles
    c. Flying objects stirred by air pressure
    d. Electric shock or electrocution

3. If someone is using a pneumatic tool, such as a pneumatic stapler, and places their hand near the discharge end of the tool, this person is in danger from which hazard(s)?

    a. Flying objects stirred by force of explosion
    b. Fumes from gasoline, exhaust, etc.
    c. Hazards from force of projectiles
    d. Electric shock or electrocution

4. Fasteners present a hazard from the force of projectiles for

    a. gasoline-powered tools
    b. electric tools
    c. pneumatic tools
    d. powder-actuated tools

POWER TOOLS AND MACHINES
SELF-TEST 3

1. A possible solution for a sawblade out of round is to

    a. check the sawblade for the correct length of teeth
    b. bend alternate teeth right and left
    c. keep sawblades clean and free of pitch buildup
    d. tension blades for the correct speed used

2. Possible solutions for cracked blades include

    a. removing cracked blades from use immediately
    b. checking blades for cracks when teeth are filed or set
    c. tensioning blades for the correct speed used
    d. all of the above
    e. none of the above

3. Gummed blades can cause a

    a. crack
    b. kickback
    c. lump or warp
    d. kerf

4. If you must work harder than necessary, or if a crack starts in a sawblade, these may be signs of

    a. a gummed blade
    b. a new blade
    c. a dull blade
    d. a sharp blade

5. A problem caused by improper hook or pitch of teeth on a sawblade can be solved by

    a. using the correct type of sawblade for the material being cut
    b. spreading the point of every tooth so each is slightly wider than the sawblade
    c. checking the blades for cracks when the teeth are filed or set
    d. keeping the blades sharp

POWER TOOLS AND MACHINES
SELF-TEST 4

1. Which of the following is one of the uses of a circular saw?

   a. Crosscutting
   b. Cutting pipe, angle iron, steel rods, metal studs
   c. Making inside curves
   d. Making relief cuts

2. Cutting pipe, angle iron, steel rods, or metal studs are all uses of a

   a. circular saw
   b. reciprocating saw
   c. jigsaw/saber saw
   d. band saw

3. Making irregular cuts, relief cuts, pocket cuts, inside curves and corner cuts are uses of a

   a. circular saw
   b. reciprocating saw
   c. jigsaw/saber saw
   d. band saw

POWER TOOLS AND MACHINES
SELF-TEST 5

1. When using a circular saw, you should set the blade deep enough to

   a. cut through the stock only
   b. cut through the stock plus one-half inch
   c. cut through the stock plus one inch
   d. cut through the stock plus one half of the thickness of the stock

2. To avoid breaking the blade on a band saw, you should

   a. guard the point of operation
   b. wear the right kind of personal protective equipment
   c. use the right size blade
   d. force the blade into the stock

3. For both the reciprocating saw and the jigsaw, you should keep your hands

   a. in line with the blade
   b. clear of the blade
   c. as close to the blade as needed for the job
   d. below the stock

Read the paragraph below before answering the questions that follow --

A co-worker has unsafely demonstrated the use of a circular saw. The worker set the blade deep enough to cut through the stock only, and removed the guard to do a special piece of work. The stock came from a pile of used boards that had been used for nailing and other purposes. After allowing the saw to reach maximum speed before starting the cut, the worker cuts the stock, holds the running saw while reaching for a second board, then gets ready for the next cut. Why was the demonstration unsafe?

4. The guard should have been

   a. replaced after the first cut
   b. free and retractable
   c. locked in the retracted position
   d. all of the above
   e. none of the above

5. Considering the source of the stock being cut, what should the worker have done before using the stock?

   a. Cleaned the board of any dirt
   b. Cut the board into smaller pieces first
   c. Taken the newest board for the job
   d. Checked the stock for nails and any other metal

6. The worker's actions after the first cut are unsafe because

   a. the worker reached for the second board
   b. the worker did not lay the saw on its side after finishing the cut
   c. the worker did not cut through both boards at the same time
   d. the second board required a different type of saw

POWER TOOLS AND MACHINES
SELF-TEST 6

1. Making irregular cuts and relief cuts are uses of a

   a. table saw
   b. radial arm saw
   c. table band saw
   d. power miter saw

2. Besides crosscutting, a power miter saw can be used for

   a. ripping
   b. dadoing
   c. cutting straight miters
   d. rabbeting

3. Which of the following is NOT one of the uses of a table saw or radial arm saw?

   a. crosscutting
   b. cutting molding
   c. rabbeting
   d. making relief cuts

POWER TOOLS AND MACHINES
SELF-TEST 7

1. When using a table saw (circular), keep the guard over the blade

    a. while using the saw
    b. after using the saw only
    c. while repairing the saw only
    d. while cleaning the saw only

2. The blade should project

    a. 1/8 inch or less above the stock
    b. 1/8 inch or more above the stock
    c. 1/2 inch or less above the stock
    d. 1/2 inch or more above the stock

3. For ripping narrow stock, you should use

    a. a miter gauge
    b. a vise
    c. a push stick
    d. a step block

4. You should get help to support

    a. wide stock
    b. long stock
    c. Both (a) and (b)
    d. new stock

5. When the blade is tilted, check to make sure the blade will clear the stock

    a. if a problem occurs
    b. if you have time
    c. after starting the saw
    d. before starting the saw

POWER TOOLS AND MACHINES
SELF-TEST 7

Read the paragraph below before answering the questions that follow --

An employee on a production sawing operation checks the sawblade. The blade projects 1/8 inch or less above the stock. The employee starts the saw. Since the break whistle will sound at any time, the employee decides to saw the stock freehand. Seeing a push stick on the other side of the sawblade, the employee quickly reaches across the blade to get the push stick.

6. The safe way to hold stock is

   a. freehand
   b. against a gauge
   c. across the sawblade
   d. in the line of the blade

7. The push stick might not prevent an accident in this situation. Why?

   a. You should use the correct blade for the job
   b. You should keep the guard over the blade while using the saw
   c. You should never reach across the sawblade
   d. You should check the blade so that it projects 1/8 inch or more above the stock before cutting

POWER TOOLS AND MACHINES
SELF-TEST 8

1. When ripping with a radial arm saw, you should feed the stock

    a. in the direction of the blade rotation
    b. against the direction of the blade rotation
    c. quickly
    d. before the saw reaches maximum speed

2. With a power miter saw, you should get help to support the end of

    a. dry stock
    b. wet stock
    c. long stock
    d. short stock

3. Forcing scrap wood into the blade on a radial arm saw, to stop the blade, is

    a. safe
    b. not a general safety rule
    c. the only way to stop the blade
    d. safe as long as the scrap wood is free of nails or any other metal

Read the paragraph below before answering the questions that follow --

A co-worker has just finished using a table band saw to cut a piece of stock 4 inches thick. The next cut will be on a piece of stock 1 inch thick. The co-worker immediately feeds the second piece of stock slowly, without stopping the saw.

4. You know that your co-worker has forgotten to

    a. feed the stock quickly
    b. take a break between cuts
    c. adjust the saw guide
    d. use the proper size blade

POWER TOOLS AND MACHINES
SELF-TEST 9

1. You should not use a bench grinder

   a. to remove paint
   b. for woods or plastics
   c. with a tool rest
   d. both (a) and (b) only
   e. none of the above

2. Before laying down a portable angle grinder, you should check to be sure the grinder head

   a. has stopped
   b. has slowed down to a safe speed
   c. is correct for the material being ground
   d. is not cracked or damaged

3. You should wear protective gloves

   a. with a bench grinder when needed
   b. with a portable angle grinder when needed
   c. with both (a) and (b)
   d. with neither (a) or (b)

POWER TOOLS AND MACHINES
SELF-TEST 10

1. You should ring test all grinding wheels

    a. after mounting each wheel
    b. before mounting each wheel
    c. if the wheel has a crack
    d. if the wheel slips while grinding

2. Straight wheels should be stored

    a. flat
    b. upright
    c. flat or upright
    d. alternating with cup, dish and saucer wheels

3. Use paper blotters

    a. on the left side of the wheel
    b. on the right side of the wheel
    c. on both sides of the wheel
    d. none of the above

4. Use the right wheel

    a. for the material
    b. for the type of grinding required
    c. both (a) and (b)
    d. none of the above

5. Tighten the mounting nut

    a. as much as possible
    b. only enough to keep the wheel from slipping
    c. one turn only
    d. two turns only

Read the paragraph below before answering the questions that follow --

You have to replace a worn bench grinder wheel. You find the correct wheel, ring test the wheel, then mount the wheel correctly. As you start the grinder to dress the wheel, the wheel strikes the tool rest and explodes.

6. What did you forget to do after mounting the wheel correctly?

    a. Reset the tool rest, spark deflector, and face shield before starting the grinder
    b. Ring test the wheel
    c. Remove the paper blotters from the sides of the wheel
    d. Dress the wheel with the grinder "off"

POWER TOOLS AND MACHINES
SELF-TEST 11

1. On a woodworking lathe, do not use stock that is

   a. cracked
   b. split
   c. knotted
   d. all of the above

2. Remove all tools from the bed of the lathe

   a. before operating the lathe
   b. while operating the lathe
   c. if you will not need the tools while operating the lathe
   d. before sanding operations only

3. Keep the safety shield in place

   a. until the stock begins to take shape
   b. when removing the tool rest
   c. when revolving the stock by hand
   d. at all times

4. Use the right speed

   a. for the diameter of the material
   b. for the hardness of the material
   c. both (a) and (b)
   d. none of the above

Read the paragraph below before answering the questions that follow --

Before taking your morning coffee break, you remove your safety goggles and face shield, and untie your apron. After returning from your break, you put on your goggles and face shield, then slip your apron on, leaving the apron untied for comfort.

5. Why are you not yet ready to work?

   a. You forgot to allow the lathe to run for 5 minutes to "warm up"
   b. You forgot to remove the tool rest
   c. You forgot to confine your loose clothing
   d. You should wear a face shield only

POWER TOOLS AND MACHINES
SELF-TEST 12

1. On a spinning lathe, set the tool rest no more than

   a. one inch from the disc
   b. two inches from the disc
   c. three inches from the disc
   d. four inches from the disc

2. Force the material slowly to match

   a. the tool rest
   b. the fulcrum pin
   c. the forming chuck
   d. the spindle nose

3. What should you stand clear of in front of the spinning lathe?

   a. the spindle nose
   b. a spinning disc
   c. both (a) and (b)
   d. none of the above

Read the paragraph below before answering the questions that follow --

A co-worker returns to the spinning lathe after taking a break to wash hands. The worker checks to be sure that all guards are in place and working properly before starting to work. You notice that your co-worker has removed a watch and a ring, and has also made sure that the apron strings are tied. The worker had to unbutton the shirt sleeves while taking the break earlier, and has left them unbuttoned for comfort. While the lathe is running, the worker bends over the lathe to get a closer look.

4. The worker has created a possible hazard by

   a. tying apron strings
   b. removing the watch
   c. removing the ring
   d. leaving shirt sleeves unbuttoned
   e. none of the above

POWER TOOLS AND MACHINES
SELF-TEST 13

1. With a machine lathe, clamp the tail stock and adjust the tool rest

   a. before starting the lathe
   b. after starting the lathe
   c. while starting the lathe
   d. as needed during the job

2. Reverse the lathe

   a. just before it has fully stopped
   b. only after it has fully stopped
   c. only while the lathe is running at full speed
   d. none of the above

3. Which of the following should you do when the lathe is NOT running?

   a. Measure the work
   b. Adjust the cutting tool
   c. Reverse the lathe
   d. Clamp the tail stock
   e. All of the above

Read the paragraph below before answering the questions that follow --

To get your production bonus, you develop a faster way to do the job. After finishing 50 parts, you can do the job almost automatically without really concentrating. At part number 91, you have to adjust the tool rest. When you restart the lathe, the chuck key is ejected and strikes the lathe bed, damaging the tool. Before you can finish the job, you first clear away some chips on and around the lathe. The chips are small enough that you can use your hands to brush them off.

4. At part number 91, you made a dangerous mistake by

   a. adjusting the tool rest
   b. not reversing the lathe
   c. not removing the chuck key
   d. not measuring the work

5. What other mistake have you made?

   a. Brushing off chips with your hands
   b. Finishing the job
   c. Completing more parts than the lathe can handle
   d. Failing to make your production bonus

POWER TOOLS AND MACHINES
SELF-TEST 14

Read the paragraph below before answering the questions that follow --

Just before quitting time, you remember that you have to drill a 1/2 inch hole in a piece of 1/4 inch plate steel. You find the proper position of the hole on the metal and punch the location on the plate. The last person to use the drill press had unbolted the vise for use in another work area. After choosing a sharp drill bit and putting on the right type of eye protection, you place the metal on the table and hold the metal with your hand. As the drill bit starts to break through the plate, the bit binds up in the hole and pulls the plate away from your hand, cutting the back of your hand.

1. The cause of your accident was

   a. choosing the wrong drill bit for the job
   b. choosing a sharp drill bit
   c. drilling a 1/2 inch hole in a piece of 1/4 inch plate steel
   d. holding the work with your hand

2. You could have prevented this accident by

   a. choosing a different drill bit
   b. securing the work with a vise or clamps
   c. holding the work with both hands instead of one hand only
   d. moving the plate steel when the drill bit started to bind
   e. using a slower speed

POWER TOOLS AND MACHINES
SELF-TEST 15

1. When using a milling machine, fasten the work

   a. if needed
   b. securely
   c. loosely
   d. while the machine is running

2. Which of the following is NOT a general safety rule for milling machines?

   a. Set the machine for the proper depth of cut
   b. Handle all cutters carefully
   c. Feed in the direction of the turning cutter
   d. Check that the work, the milling machine table, and any holding device clears the arbor and support

Read the paragraph below before answering the questions that follow --

You are hearing a co-worker describe a job on the milling machine. After fastening the work securely, your co-worker calculates the correct feed and sets the machine for the proper depth of cut. Pushing a mallet to one side of the machine table, your co-worker starts the job and stands in front of the running machine. You realize that this co-worker must not have been present at the last safety meeting.

3. The table should be

   a. clear of any tools
   b. clear of any tools that you will not need
   c. cleaned with a rag
   d. cleared while the cutter is turning

4. Your co-worker's position at the machine is not safe because you should

   a. always have two persons in the operator's zone
   b. always stand outside the operator's zone
   c. stand to one side of the machine
   d. none of the above

5. After fastening the work, your co-worker forgot to

   a. check that the work clears the arbor and support
   b. check that the milling machine table clears the arbor and support
   c. check that any holding device clears the arbor and support
   d. all of the above
   e. none of the above

POWER TOOLS AND MACHINES
SELF-TEST 16

1. To help prevent kickbacks when working with a jointer, do not cut deeper than

   a. 1/8 inch
   b. 1/4 inch
   c. 3/8 inch
   d. 1/2 inch

2. Allow the jointer to reach maximum speed

   a. after starting the cut
   b. before starting the cut
   c. while adjusting the depth of the cut
   d. while the guard is in the open position only

3. Use stock that is

   a. longer than 12 inches
   b. wider than 1 inch
   c. longer than 12 inches and wider than 1 inch
   d. longer than 8 inches and wider than 1 inch

4. To protect your hands and fingers, you should

   a. keep fingers as high as possible
   b. not drag your thumb at the back of the stock
   c. change the position of your hands when passing work over the jointer
   d. all of the above
   e. none of the above

5. When should the blades be guarded?

   a. when the blade starts to bind
   b. when the stock nears the blade
   c. when the jointer is not running
   d. when jointing narrow or flat pieces of stock
   e. at all times

POWER TOOLS AND MACHINES
SELF-TEST 17

1. When using a portable drill or hammer drill, you should remove the chuck key

   a. before starting the drill
   b. after starting the drill
   c. only if a problem occurs
   d. only if told to do so

2. To clear the hole on deep cuts using a portable drill or hammer drill, you should

   a. force the drill through the stock
   b. alternate your pressure on the drill
   c. rotate the stock
   d. back out the drill often

3. With a portable drill and hammer drill, you should not

   a. use auger bits designed for a hand brace
   b. stop the drill by holding the chuck
   c. force the drill into the stock
   d. point the drill at anyone
   e. all of the above

4. With a portable screwdriver, you should not

   a. place the screw point against any part of your body
   b. hold your hand behind the material receiving the screw
   c. use a portable screwdriver for a job that can be done with a hand tool
   d. both (a) and (b)
   e. none of the above

POWER TOOLS AND MACHINES
SELF-TEST 18

1. How much pressure should you use with a pneumatic nailer and stapler?

    a. As much as possible
    b. As little as possible
    c. As specified by the manufacturer
    d. Enough pressure to go through the stock plus 1 inch

2. The nails and staples should be

    a. designed for the fastener being used
    b. any usable type, since all nails and staples are interchangable
    c. re-used when possible
    d. tested by discharging the fastener once or twice before you actually start nailing or stapling

3. Which of the following is NOT a general safety rule for using pneumatic nailers and staplers?

    a. Use fasteners on soft or thin material that nails can go through
    b. Never point fasteners at anyone, including yourself
    c. Keep your hands and body away from the discharge end of the fastener
    d. Watch out for discharge when attaching the fastener to the air supply

Read the paragraph below before answering the questions that follow --

You see two workers at the next work station. They are talking, and one of them is getting ready to use a pneumatic stapler. As the two workers talk, one of them fumbles around with the hose attached to the stapler, trying to connect the tool to the air supply. The worker holds the stapler in the other hand, pointing it at the other worker without looking at the tool or the air supply. Both workers are talking and working at the same time.

4. What should these workers remember about the air supply?

    a. Use low pressure only, in case of accidental discharge
    b. Watch out for discharge when attaching the fastener to the air supply
    c. Handle the tool and the air hose with the same hand
    d. None of the above

5. The worker creates a dangerous situation by holding the tool in hand without paying attention to it, because you should

    a. pay attention when pointing any pneumatic tool at another person
    b. handle the tool and the air hose with the same hand
    c. have someone else hold the tool while you attach the air supply
    d. never point fasteners at anyone, including yourself

SELF-TEST 19

1. Use gasoline-powered tools only in

   a. a well-ventilated area
   b. a poorly-ventilated area
   c. a fireproof area
   d. your own work area

2. Clean up any spilled fuel

   a. as soon as you can
   b. at the end of each work day
   c. as soon as you finish the job with the tool
   d. immediately

Read the paragraph below before answering the questions that follow --

You see a disorganized work area. Hand tools and power tools, including gasoline-powered tools, are everywhere. A gasoline can is on the floor with its lid open. A small stain is on the floor around the can. The "No Smoking" sign is hidden behind some boxes, and a half-full ashtray is visible on the cabinet. You see hazards everywhere!

3. You should never

   a. store hand tools and power tools together
   b. light a match or create a spark around any gasoline-powered tool
   c. leave a gasoline can on the floor
   d. smoke

4. The stain around the gasoline can tells you that the worker probably did not

   a. clean up any spilled fuel immediately
   b. refill the fuel tank after the tool had cooled down
   c. use the tool in a well-ventilated area
   d. have time to clean up the spill

POWER TOOLS AND MACHINES
ANSWERS TO SELF-TESTS

NOTE: Check the appropriate pages in this unit for more information or explanations.

SELF-TEST 1

1. a; 2. d; 3. d; 4. c; 5. b

SELF-TEST 2

1. d; 2. a; 3. c; 4. d

SELF-TEST 3

1. a; 2. d; 3. b; 4. c; 5. a

SELF-TEST 4

1. a; 2. d; 3. b

SELF-TEST 5

1. a; 2. c; 3. b; 4. b; 5. d; 6. b

SELF-TEST 6

1. c; 2. c; 3. d

SELF-TEST 7

1. a; 2. a; 3. c; 4. c; 5. d; 6. b; 7. c

SELF-TEST 8

1. b; 2. c; 3. b; 4. c

SELF-TEST 9

1. d; 2. a; 3. b

SELF-TEST 10

1. b; 2. b; 3. c; 4. c; 5. b; 6. a

SELF-TEST 11

1. d; 2. a; 3. d; 4. c; 5. c

SELF-TEST 12

1. a; 2. c; 3. c; 4. d

SELF-TEST 13

1. a; 2. b; 3. e; 4. c; 5. a

SELF-TEST 14

1. d; 2. b

SELF-TEST 15

1. b; 2. c; 3. a; 4. c; 5. d

SELF-TEST 16

1. a; 2. b; 3. c; 4. d; 5. e

SELF-TEST 17

1. a; 2. d; 3. e; 4. d

SELF-TEST 18

1. c; 2. a; 3. a; 4. b; 5. d

SELF-TEST 19

1. a; 2. d; 3. b; 4. a

6 6 6 6 6 6 6 6

Guarding

Guarding

Guarding

Guarding

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Guarding

INSTRUCTOR'S GUIDELINES

OBJECTIVE: The objective of this presentation is to instruct participants in the common types of machine guards and the hazards that they protect against. This presentation does not include guidelines for using machines. The goal of this presentation is to promote awareness of machine guards as important tools for safety and accident prevention on the job.

1. USE this unit as a source of supplemental safety training in machine guarding

2. ORDER or OBTAIN supplemental training materials for your presentation

    a. Films and videotape

    b. Written materials

        (1) 29 CFR 1910 of the OSHA General Industry Safety and Health Standards -- Selected sections as needed

        (2) Accident Prevention Manual for Industrial Operations -- Engineering and Technology (Current Edition), from the National Safety Council

        For current catalog, write or call the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois, 60611 or 1-800-621-7619; or contact the Oklahoma Safety Council, P.O. Box 14686, Oklahoma City, Oklahoma 73113 or (405) 848-8626

        (3) Safety posters, available from the National Safety Council in their Poster Directory (Current Edition)

        See the address and phone number listed under (2)

    c. Chalkboard, flip chart, chalk, marking pens, etc.

3. LIST the different types of machine guards used on the machines at your job site

    HINT: Use your list as you discuss the different types of machine guards in this presentation. Make your discussions focus on the specific machine guards used at your job site and in specific work areas.

INSTRUCTOR'S GUIDELINES

4. ASK participants about the role of each machine guard used on the equipment in their work areas:

   HINT: Discuss these questions at the appropriate time in your presentation. You could ask these questions about each of the types of machine guards presented in this unit, as you discuss each type. (You could also use these questions to quiz participants about the machine guards in place in their work areas.)

   a. Do they understand the hazards of working with their machines and around other machines?
   b. Can they locate the guards and any safety devices on their machines?
   c. Do they know how each guard and safety device works?
   d. Can they identify the hazards that each guard and safety device protects against?
   e. Do they recognize the limitations of each guard and safety device? (Machine guards cannot substitute for safety awareness by participants every day)

5. EXPLAIN or REVIEW your company's safety policies or guidelines for working with machine guards

6. INVITE a guest speaker -- someone who was injured in an accident-- to speak about the importance of machine guards

7. STATE that machines have no feelings -- operators must be aware of potential dangers and work to prevent accidents

INSTRUCTOR'S GUIDELINES

Glossary

1. DISCUSS the terms and definitions
2. ADD terms and definitions that apply to your job site

GUARDING

GLOSSARY

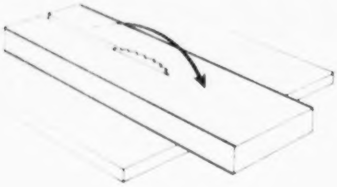
1. Catch Points -- The parts or surfaces of a machine that can catch on clothing or other materials due to rough edges, sharp corners or points, unusual shapes, or rough-textured surfaces.

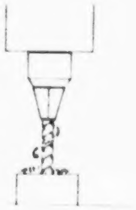
2. Nip Points -- The points where two objects are in contact with each other and are rotating inward (such as rollers).

3. Pinch Points -- The points where two or more moving parts of a machine or tool come together.

4. Point of Operation -- The point on a tool or machine where the work is performed on the stock or material (i.e., the point on a power saw where the stock is being cut, the point where a grinder is grinding, etc).

EXAMPLE:





From Concepts and Techniques of Machine Safeguarding (OSHA 3067), U.S. Department of Labor, Occupational Safety and Health Administration, 1980 (reprinted 1983). Unless otherwise noted, all figures in this unit are from OSHA publication 3067.

5. Shear Points -- The points where two moving parts of a machine or tool pass each other closely with a scissor-like action.

INSTRUCTOR'S GUIDELINES

Hazards That Require Guards

1. EMPHASIZE the opening statement -- GIVE examples of other types of hazards that require guards (especially hazards at your job site)

2. DISCUSS the examples listed for each type of hazard

   HINT: Illustrate each example by referring to machines and equipment at your job site where each of the examples are present. For example, use a machine at your job site to illustrate shearing and slicing actions, reciprocating motions, etc.

3. ASK participants to identify examples from their own work areas of each type of hazard listed

   HINT: Keep a list of all responses, visible to everyone in the room, so that participants can see the variety of hazards that must be limited through machine guards every day.

4. ASK participants to explain possible accidents that could happen as the result of each hazard

GUARDING

HAZARDS THAT REQUIRE GUARDS

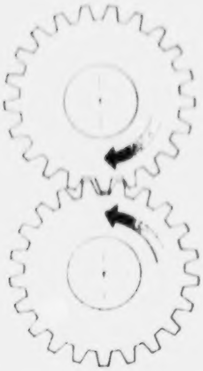
NOTE: This list does not include all hazards.

Type of Hazard	Examples
Motions	Rotating
	Reciprocating -- back and forth, up and down
	Transversing -- moving in a straight line
Actions	Cutting
	Bending and forming
	Punching
	Shearing and slicing
Locations	Points of operation
	Moving machine parts in operation
	Power sources -- flywheels, belts, pulleys, cranks, gears, chains, spindles, etc

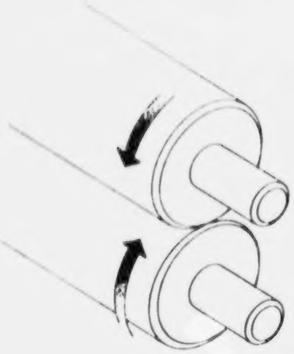
GUARDING

HAZARDS THAT REQUIRE GUARDS

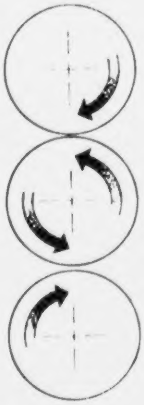
Motions



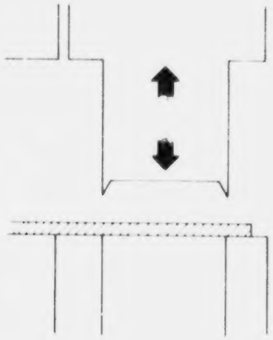
Intermeshing Gears



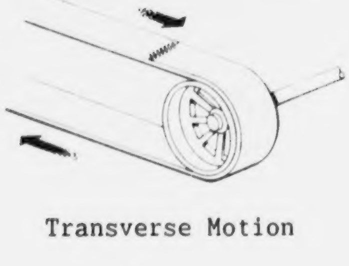
Rolling Mills



Calenders



Punching

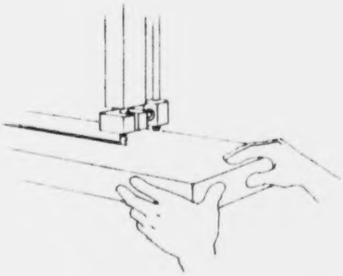


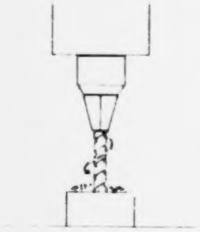
Transverse Motion

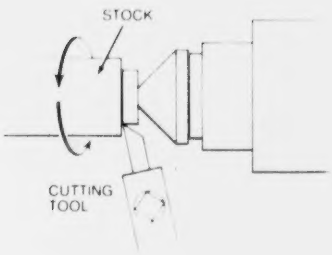
GUARDING

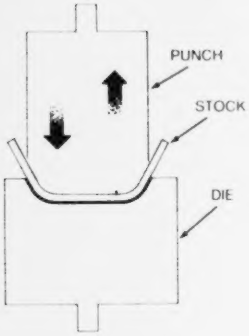
HAZARDS THAT REQUIRE GUARDS

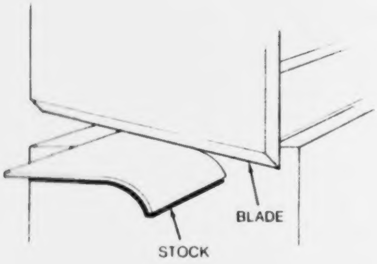
Actions


Cutting


Drilling


STOCK
CUTTING TOOL
Forming

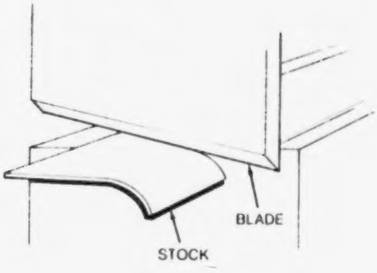

PUNCH
STOCK
DIE
Bending


BLADE
STOCK
Shearing and Slicing

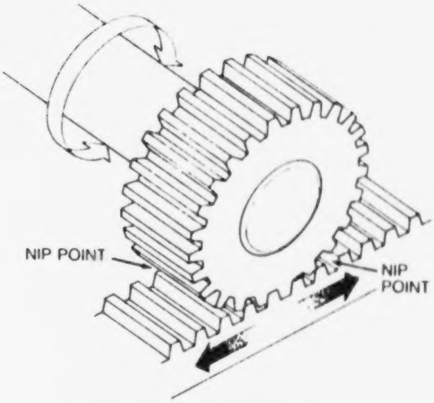
GUARDING

HAZARDS THAT REQUIRE GUARDS

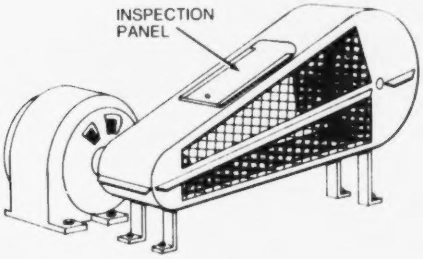
Locations


BLADE
STOCK

Points of Operation


NIP POINT
NIP POINT

Moving Machine Parts
in Operation


INSPECTION PANEL

Power Sources

INSTRUCTOR'S GUIDELINES

Principles of Guarding

1. DISCUSS each of the Principles Of Guarding

   HINT: Ask participants whether the guards used in their work areas cover all of the Principles listed. If any guard violates any principle, discuss any corrective steps needed. For example, if a guard does not prevent access to the danger zones on and around machines or tools, then explain possible ways to satisfy that Principle and prevent access.

2. ASK participants to describe typical machine guards in their work areas and how those guards meet the Principles listed

   HINT: If machine guards are removed for any reason, such as during equipment maintenance, the guards must meet the Principles after they are re-installed also!

3. EXPLAIN that the Principles Of Guarding can be used when evaluating different types of machine guards

   HINT: For example, specifications for machine guards can become part of a list of equipment specifications when purchasing machines and equipment.

GUARDING

PRINCIPLES OF GUARDING

Guards and Methods of Guarding should . . .

PROTECT the operator(s) of machines and tools from the hazards of motions, actions, and locations

PROTECT other persons in the work area

PROTECT equipment against damage or breakdown from objects falling into machinery, unauthorized use of the machine or tool, or dangerous changes to the machine or tool

PREVENT access to the danger zones on and around machines or tools

PREVENT contact with moving parts and dangerous parts or surfaces

CREATE no new hazards

CREATE no added interference with the machine's process, service and maintenance procedures, and operator's job duties

INSTRUCTOR'S GUIDELINES

Types of Guards -- Safeguarding Actions

1. EXPLAIN each type of guard and its safeguarding action(s)
2. GIVE examples of each type of guard as it is used at your job site.

GUARDING

TYPES OF GUARDS

Safeguarding Actions

Type	Safeguarding action
Fixed Enclosure Guards (provides most protection)	Prevent access to dangerous machine parts at all times by enclosing hazardous operations completely Restrain bursting or breaking machine parts Admit stock only due to limited size of feed opening
Interlocking Enclosure Guards (first alternative to fixed enclosure guards)	Stop power when guard is in open position or is removed Guard danger zones until the guard is back in place Stay closed until the guarded part stops Are not fixed
Adjustable Guards	Provide a barrier that can be adjusted for a variety of operations
Self-Adjusting Guards	Provide a barrier that moves according to the size of the stock entering the danger area

INSTRUCTOR'S GUIDELINES

Types of Guards -- Advantages and Disadvantages

1. DISCUSS the advantages and disadvantages of each type of guard

2. USE the machines at your job site to help explain the concepts of machine guarding, as much as possible.

   NOTE: The diagrams are examples only.

GUARDING

TYPES OF GUARDS

Advantages and Disadvantages

Fixed Enclosure Guards

ADVANTAGES

Can be built for specific uses

Can offer maximum protection

Usually requires minimum maintenance

Can operate with high production and repetitive operations

DISADVANTAGES

May interfere with the operator's visibility

May be limited only to specific operations

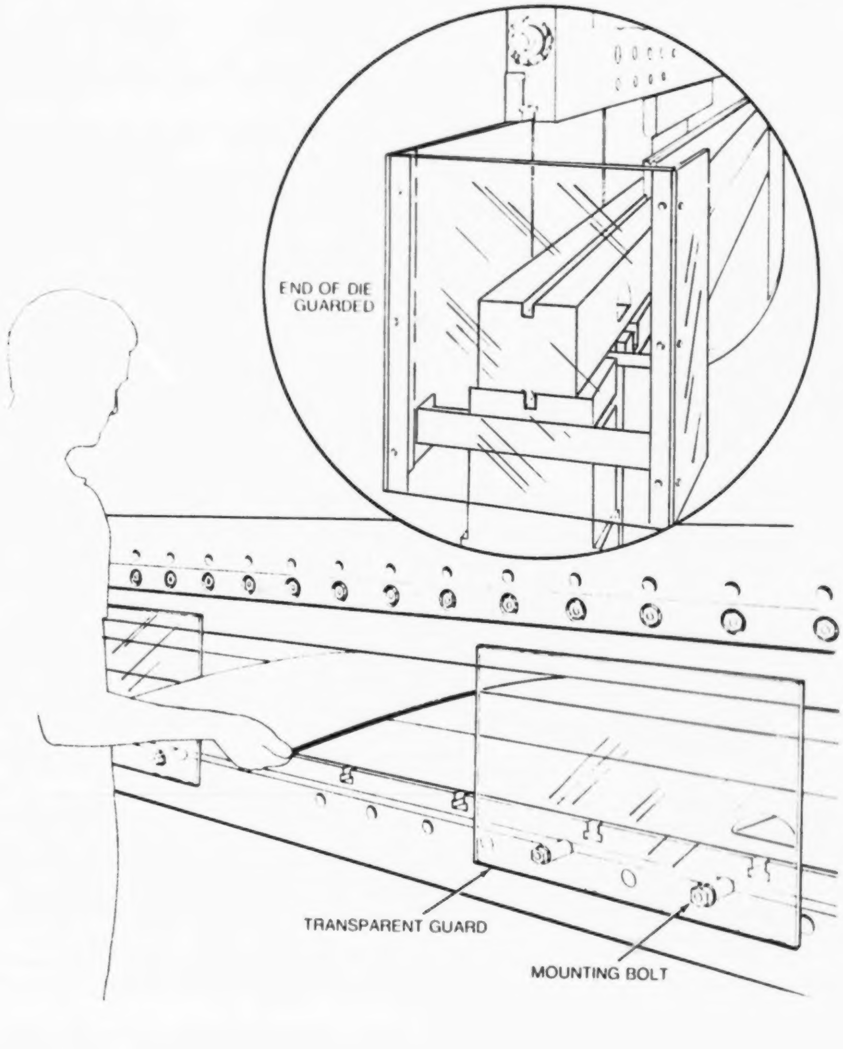
May have to be removed before equipment repair or maintenance -- substitute protection may be needed for maintenance workers

GUARDING

TYPES OF GUARDS

Advantages and Disadvantages

Fixed Enclosure Guards


END OF DIE GUARDED
TRANSPARENT GUARD
MOUNTING BOLT

GUARDING

TYPES OF GUARDS

Advantages and Disadvantages

Interlocking Enclosure Guards

ADVANTAGES

Allows easy access to the machine to remove jams without having to remove a fixed guard

DISADVANTAGES

Requires careful adjustment and maintenance

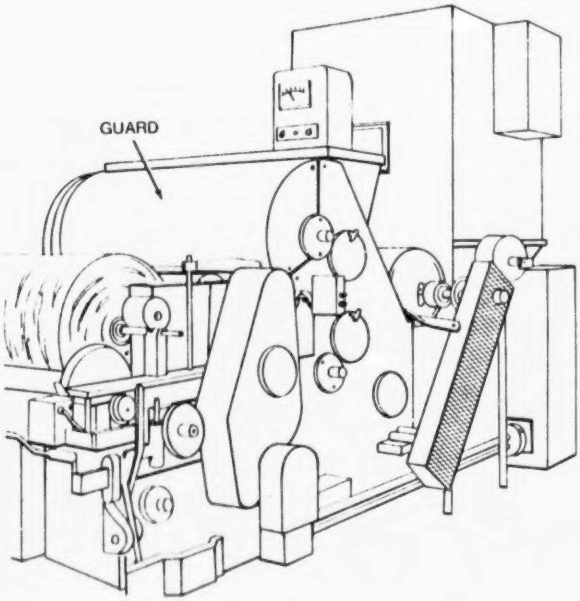
May be easy to disengage

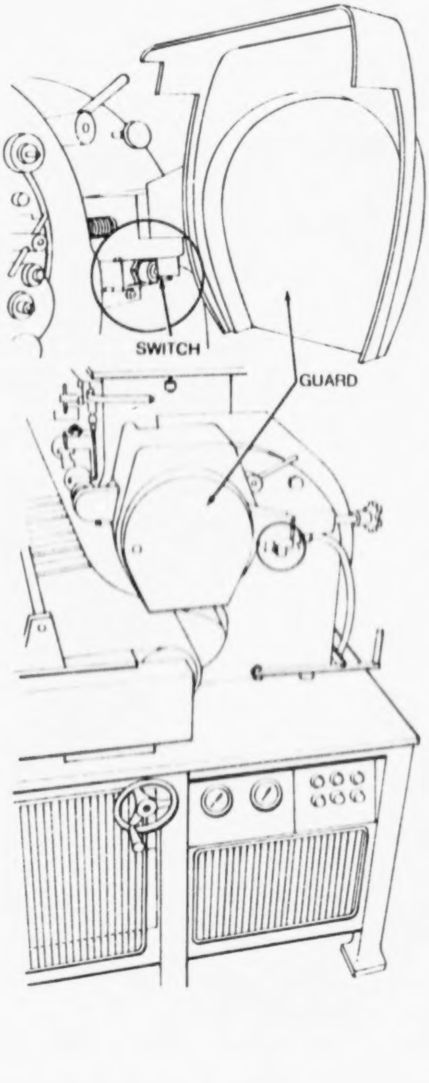
GUARDING

TYPES OF GUARDS

Advantages and Disadvantages

Interlocking Enclosure Guards




SWITCH
GUARD

GUARDING

TYPES OF GUARDS

Advantages and Disadvantages

Adjustable Guards

ADVANTAGES

Can be built for specific uses

Can admit different sizes of stock

DISADVANTAGES

May not offer complete protection at all times -- could allow hands to enter a danger zone

May require frequent maintenance and/or adjustment

Operator can make the guard ineffective

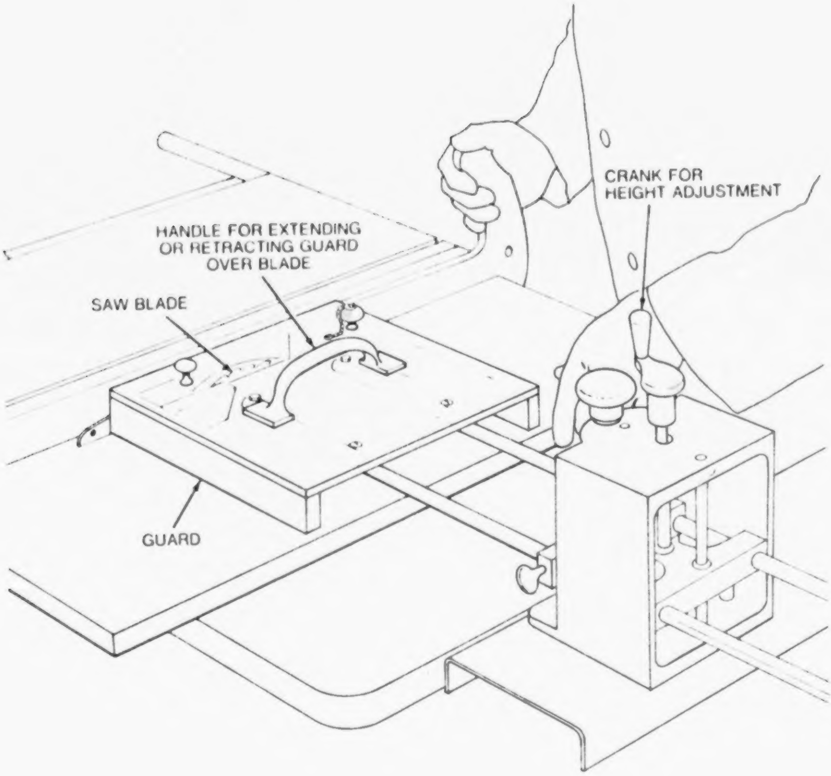
May interfere with the operator's visibility

GUARDING

TYPES OF GUARDS

Advantages and Disadvantages

Adjustable Guards


HANDLE FOR EXTENDING OR RETRACTING GUARD OVER BLADE
CRANK FOR HEIGHT ADJUSTMENT
SAW BLADE
GUARD

GUARDING

TYPES OF GUARDS

Advantages and Disadvantages

Self-Adjusting Guards

ADVANTAGES

Are often commercially available

Allow for different sizes of stock by admitting the stock as the operator moves the stock into a danger zone

DISADVANTAGES

Do not always offer maximum protection -- offer different degrees of protection

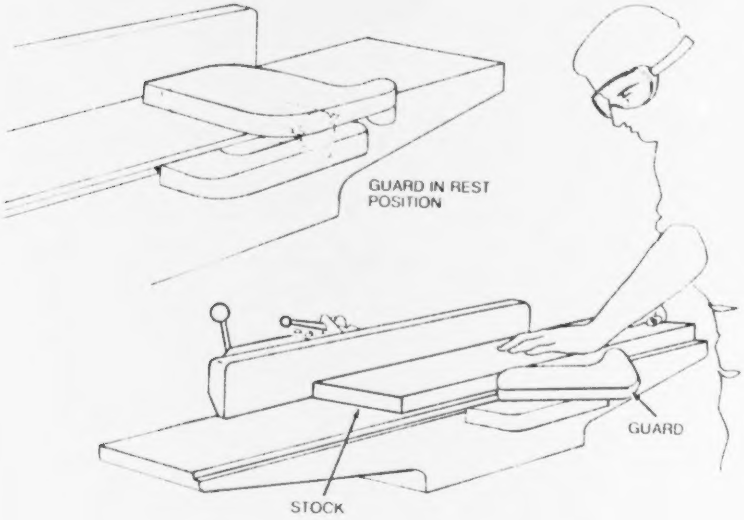
May require frequent maintenance and/or adjustment

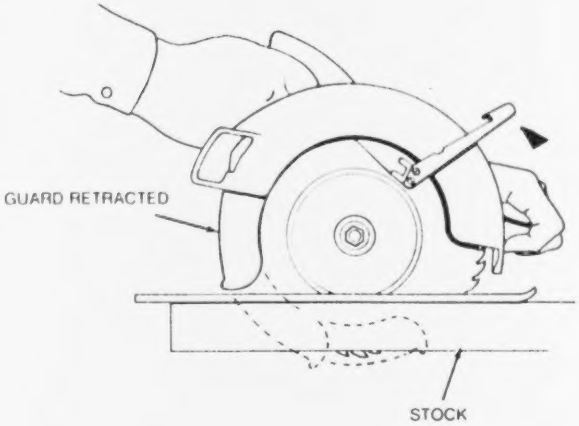
May interfere with the operator's visibility

TYPES OF GUARDS

Advantages and Disadvantages

Self-Adjusting Guards


GUARD IN REST POSITION
GUARD
STOCK


GUARD RETRACTED
STOCK

INSTRUCTOR'S GUIDELINES

Safety Devices

1. EXPLAIN the difference between safety devices and machine guards

   NOTE: A guard prevents access to a danger area. A safety device controls access to a danger area.

2. DISCUSS the types of safety devices used at your job site, and the safeguarding action(s) of each

   NOTE: The diagrams are examples only. You should use the machines at your job site to help explain the concepts of safety devices, as much as possible.

3. ASK participants to explain to the rest of the group how the safety devices in their work areas are used

GUARDING

SAFETY DEVICES

Method	Safeguarding Action
Photoelectric (optical)	Prevents the machine from cycling when light field is broken Brakes the machine immediately when the operator's body breaks the light field
Radiofrequency (capacitance)	Prevents the machine from cycling when capacitance field is broken Brakes the machine immediately when the operator's body breaks the capacitance field
Electromechanical (contact bar or probe)	Prevents the machine from cycling when movement of the contact bar or probe is interrupted Moves a specified distance between the operator and the danger zone
Pullback	Pulls the operator's hands back from the danger zone as the machine starts to cycle
Holdback (restraint)	Prevents the operator from reaching into the danger zone

GUARDING

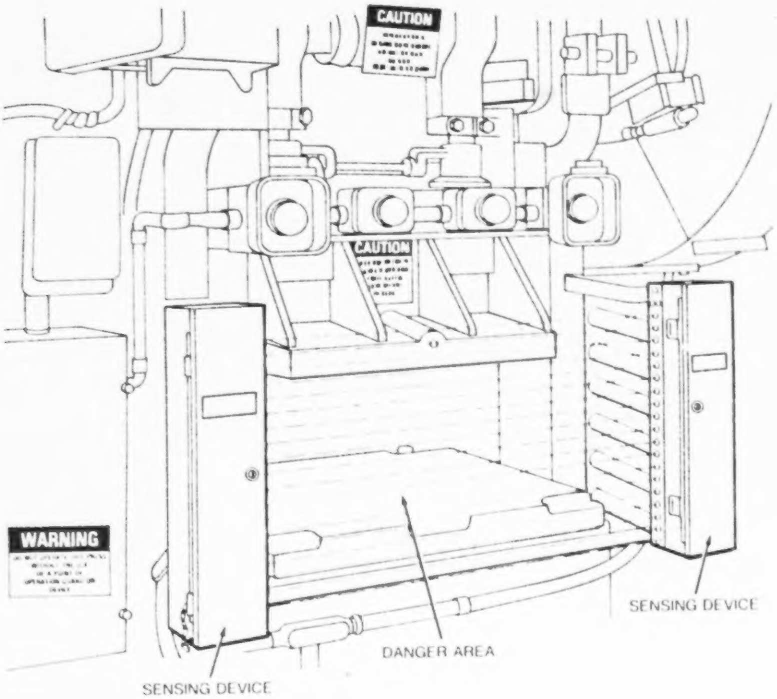
SAFETY DEVICES

Method	Safeguarding Action
Trip Control **(body bar, triprod, tripwire)**	Stops the machine when trip is activated Body bar -- stops the operation when pressure is applied to the bar when the operator trips, loses balance, or is drawn into the machine Triprod -- stops the machine when pressed by the operator's hand in an emergency Tripwire -- stops the machine when activated by either of the operator's hands
Two-Hand Control	Prevents the machine from operating--keeps the operator from entering the danger zone -- unless the operator uses both hands to activate specific buttons, valves, or levers at the same time (two operators can also activate these controls)
Two-Hand Trip	Requires the operator to use both hands at the same time to activate control buttons that will start the machine's cycle Keeps the operator's hands away from the point of operation when the machine's cycle begins
Gate	Provides a barrier between the danger zone and the operator or other persons nearby

GUARDING

SAFETY DEVICES

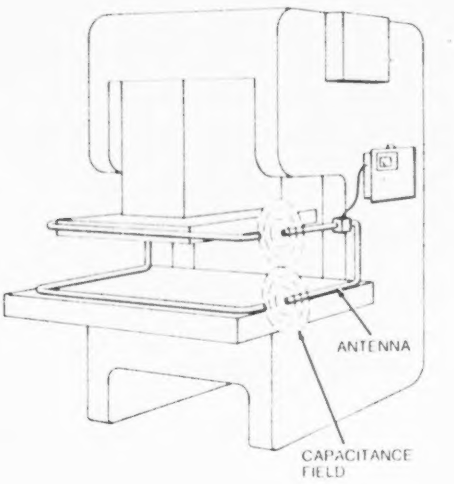
Photoelectric (Optical)


CAUTION
CAUTION
WARNING
SENSING DEVICE
DANGER AREA
SENSING DEVICE

GUARDING

SAFETY DEVICES

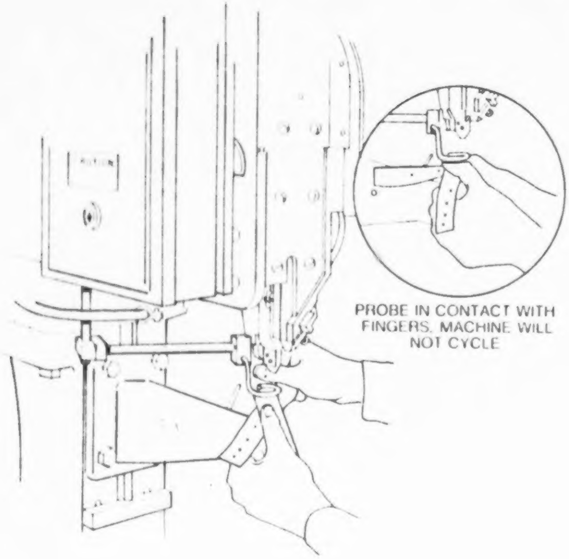
Radiofrequency (Capacitance)


ANTENNA
CAPACITANCE FIELD

GUARDING

SAFETY DEVICES

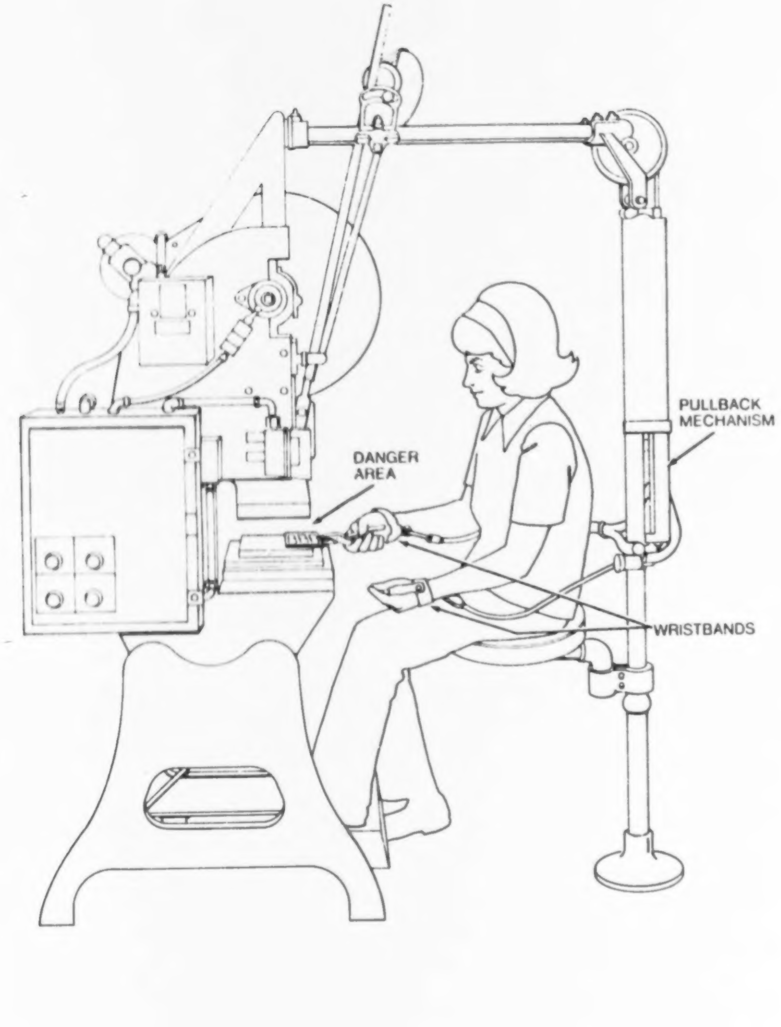
Electromechanical


PROBE IN CONTACT WITH FINGERS, MACHINE WILL NOT CYCLE

GUARDING

SAFETY DEVICES

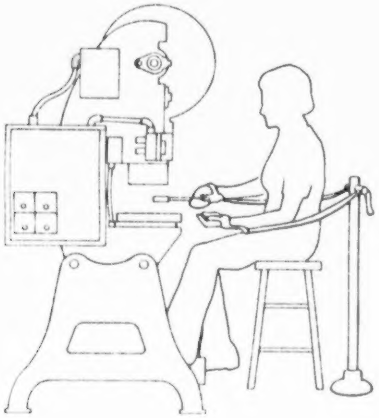
Pullback Device


PULLBACK MECHANISM
DANGER AREA
WRISTBANDS

GUARDING

SAFETY DEVICES

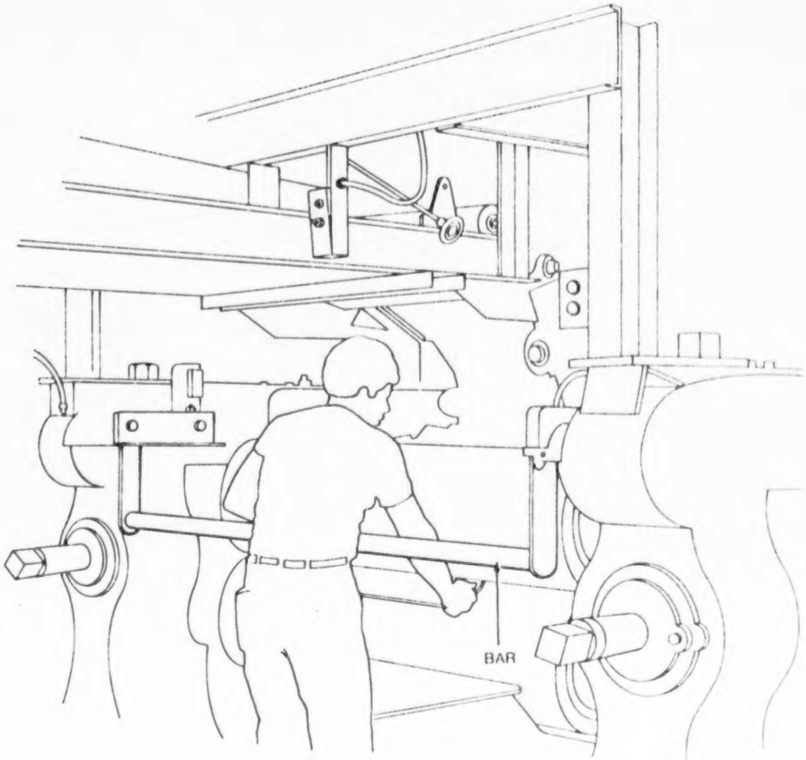
Holdback (Restraint) Device



GUARDING

SAFETY DEVICES

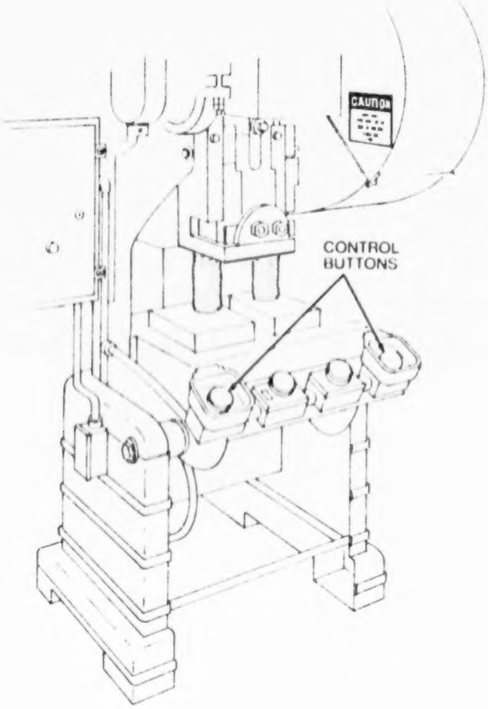
Trip Control



GUARDING

SAFETY DEVICES

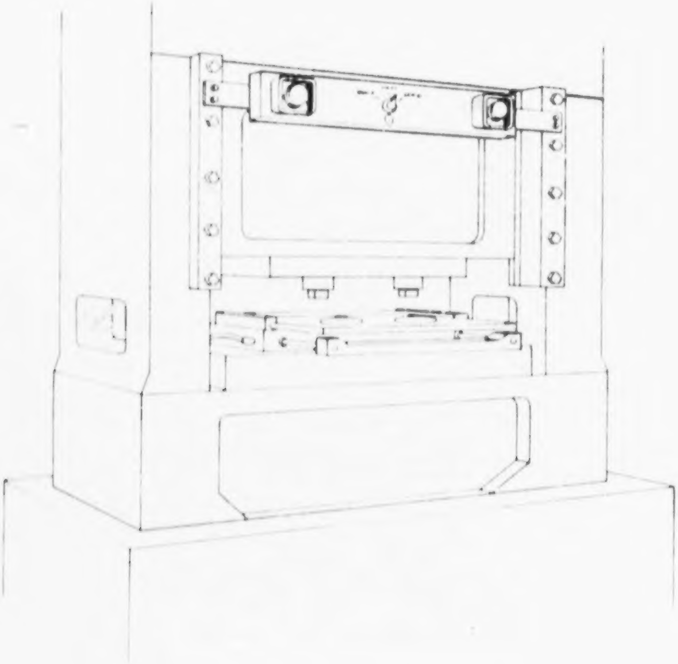
Two-Hand Control


CAUTION
CONTROL BUTTONS

GUARDING

SAFETY DEVICES

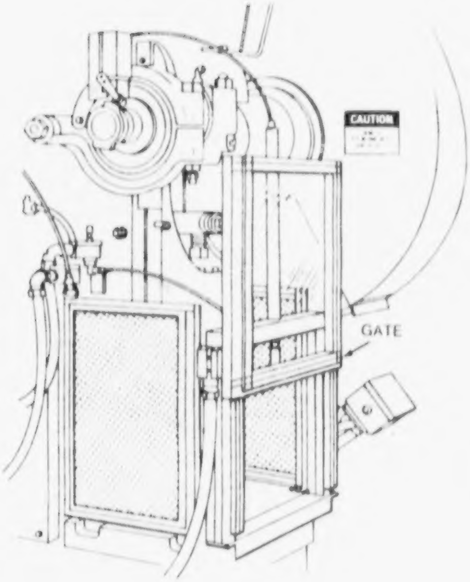
Two-Hand Trip



GUARDING

SAFETY DEVICES

Gate


CAUTION
GATE

INSTRUCTOR'S GUIDELINES

User-Made Guards

1. DISCUSS the advantages and disadvantages of user-made guards

   HINT: Ask participants to give other examples of advantages and disadvantages, if possible.

2. GIVE examples of machines at your job site that have user-made guards

   HINT: Ask participants to identify the user-made guards in place on machinery in their work areas, as well as the advantages and disadvantages of each guard. For any disadvantages given, explain possible ways to eliminate the disadvantages safely.

3. EXPLAIN your company's policies concerning user-made guards

   HINT: Are user-made guards allowed? If yes, then what guidelines or restrictions apply to their construction and use?

GUARDING

USER-MADE GUARDS

ADVANTAGES

May be the only practical and safe way to use older machinery

Adapt machines and tools to your special situations and needs

Promote your safety awareness

DISADVANTAGES

May not fit the machine or tool well

May not allow the machine or tool to operate normally

May not be properly designed and built

INSTRUCTOR'S GUIDELINES

Supplemental Safety Devices

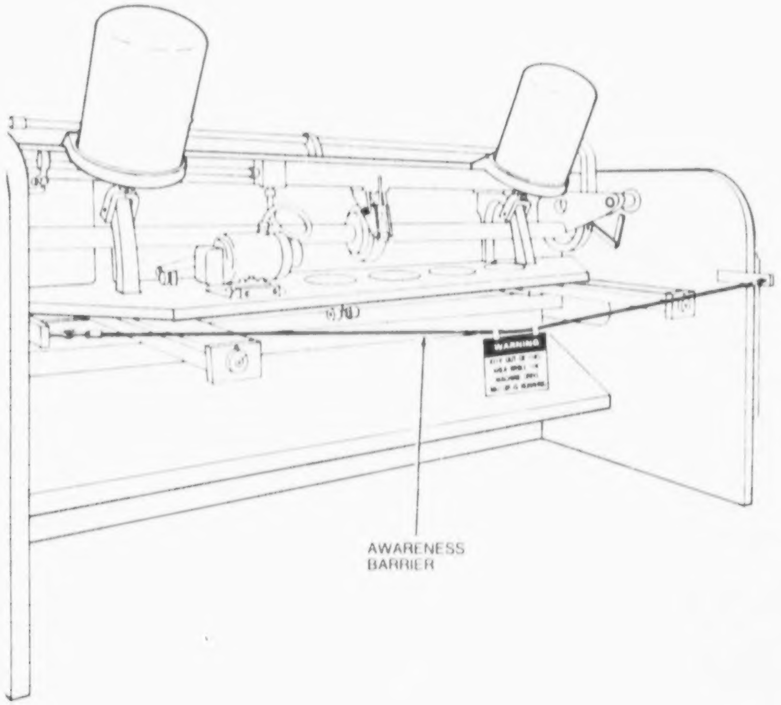
1. DEFINE each device
2. GIVE examples of each device and its use at your job site
3. EMPHASIZE the NOTE for each device

GUARDING

SUPPLEMENTAL SAFETY DEVICES

Awareness Barrier

Definition -- A supplemental safety device that reminds you that you are approaching a danger zone.



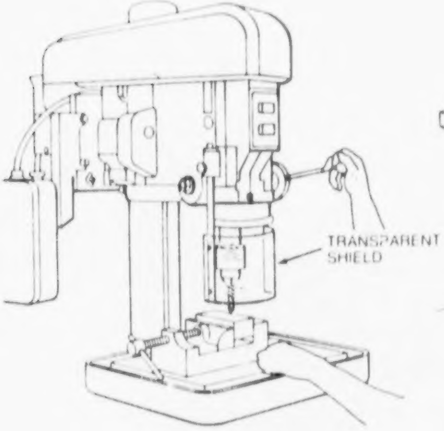
NOTE: This device may give you an extra margin of safety. It does not offer complete protection from machine hazards. Use this device only with the proper type of guard, not as a substitute.

GUARDING

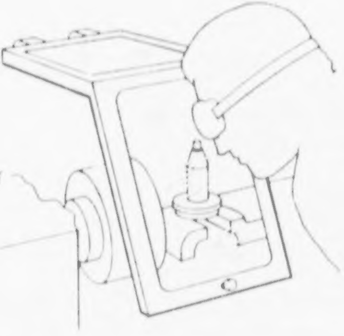
SUPPLEMENTAL SAFETY DEVICES

Transparent Shields

Definition -- A supplemental safety device that can protect you from flying particles, splashes, or splatters.



DRILL



LATHE

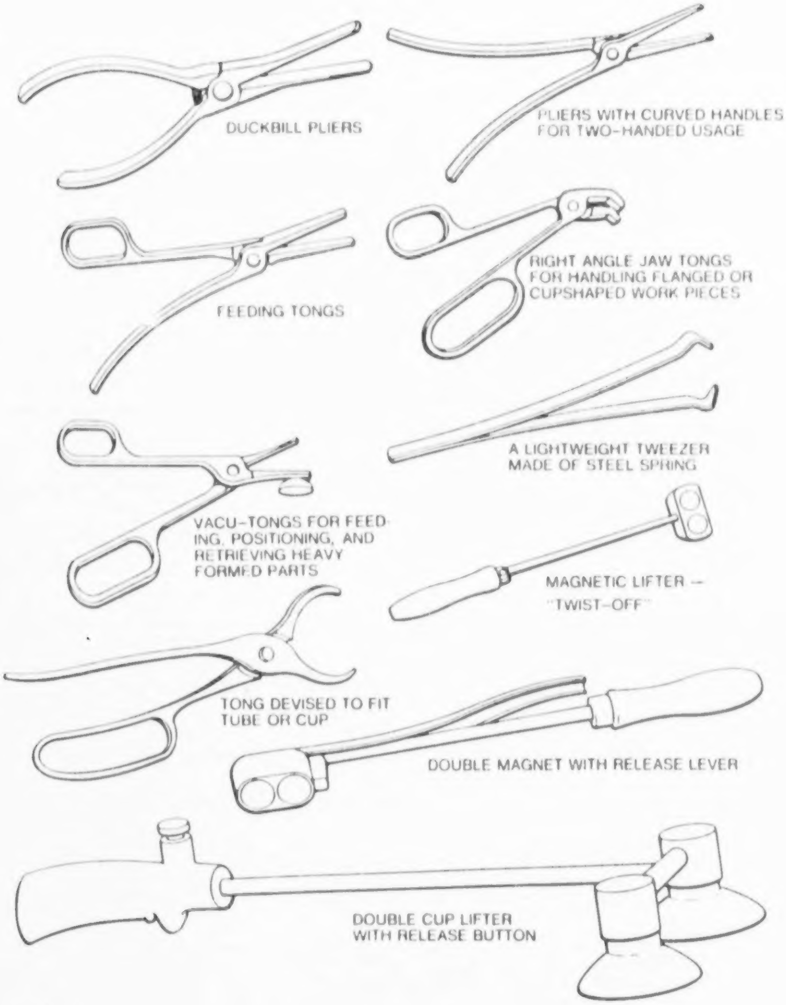
NOTE: This device may give you an extra margin of safety. It does not offer complete protection from machine hazards. Use this device only with the proper type of guard, not as a substitute.

GUARDING

SUPPLEMENTAL SAFETY DEVICES

Holding Tools

Definition -- A supplemental safety device used to place or remove stock.

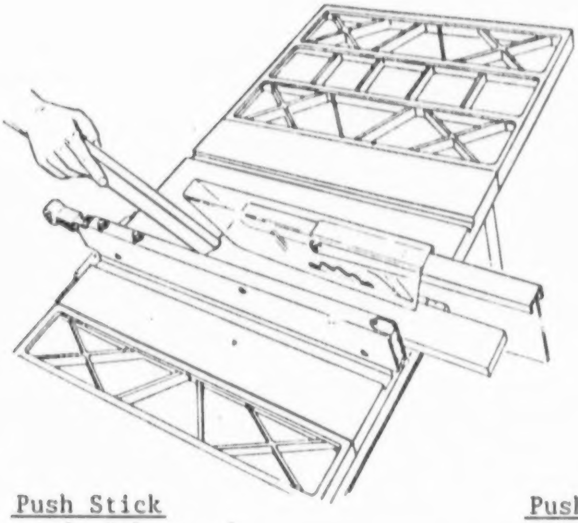

DUCKBILL PLIERS
PLIERS WITH CURVED HANDLES FOR TWO-HANDED USAGE
FEEDING TONGS
RIGHT ANGLE JAW TONGS FOR HANDLING FLANGED OR CUPSHAPED WORK PIECES
A LIGHTWEIGHT TWEEZER MADE OF STEEL SPRING
VACU-TONGS FOR FEEDING, POSITIONING, AND RETRIEVING HEAVY FORMED PARTS
MAGNETIC LIFTER — "TWIST-OFF"
TONG DEVISED TO FIT TUBE OR CUP
DOUBLE MAGNET WITH RELEASE LEVER
DOUBLE CUP LIFTER WITH RELEASE BUTTON

NOTE: This device may give you an extra margin of safety. It does not offer complete protection from machine hazards. Use this device only with the proper type of guard, not as a substitute.

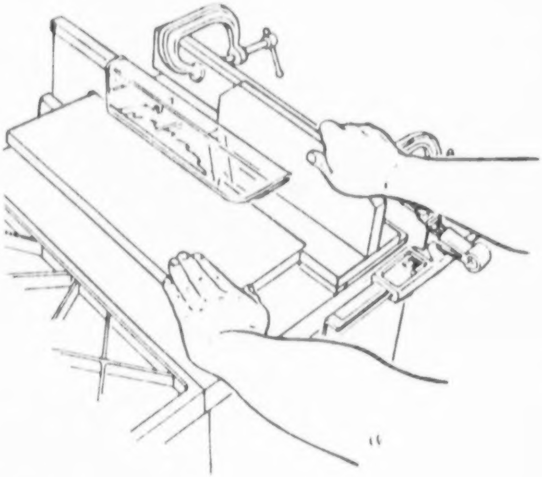
SUPPLEMENTAL SAFETY DEVICES

Push Stick and Push Block

Definition -- Supplemental safety devices used to feed stock into a saw blade.



Push Stick
used with guard



Push Block
used with guard

NOTE: This device may give you an extra margin of safety. It does not offer complete protection from machine hazards. Use this device only with the proper type of guard, not as a substitute.

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INSTRUCTOR'S GUIDELINES

Basic Information for Machine Operators

1. EXPLAIN that operators of machines should be able to answer "Yes" to each question before they operate their machine(s)
2. ASK different participants to answer these questions about their machines
3. ADD any other items to the list, specific to your job site

GUARDING

BASIC INFORMATION FOR MACHINE OPERATORS

NOTE: This list may not be complete for your job site.

Machine Operators Should Know . . .

---

1. TYPES OF HAZARDS associated with the machine, its functions, and operations

   Do you understand the hazards of working with your machine(s) and working around other machines?

   Does the job require personal protective equipment? If yes, do you know the type and location of the equipment?

   Are you dressed safely for the job?
   (No loose-fitting clothing, jewelry, etc; wearing the right type of personal protective equipment)

2. TYPES OF GUARDS used with the machine and any SUPPLEMENTAL SAFETY DEVICES that may safely be used

   Can you locate the guards and safety devices on your equipment or in your work area?

   Do you know how each guard and safety device works?

   Do you understand the hazards that each guard and safety device protects against?

   Do you know the limitations of each guard and safety device? (What can they do and not do?)

3. RULES for using guards and safety devices properly and safely

   Do you know when and when not to use each guard and safety device?

   Do you know the correct use of each guard and safety device?

GUARDING

BASIC INFORMATION FOR MACHINE OPERATORS

NOTE: This list may not be complete for your job site.

Machine Operators Should Know . . .

---

4. CONDITIONS for removing or changing guards, as well as the persons authorized to remove or change the guards

   NOTE: You should never remove or change any guards, if you are not authorized to do so under specific conditions.

   Do you know when and how guards can be removed?

   Do you know the steps to take (at your job site) if you notice guards that are damaged, missing, or not working properly?

   Do you know who is authorized (at your job site) to remove guards? Who can lockout machines?

5. YOUR RESPONSES when a guard fails, when a guard is defective or missing, when a guard does not offer enough protection, or in emergency situations

INSTRUCTOR'S GUIDELINES

General Safety Rules

1. REFER to 29 CFR 1910.211-222 for guarding requirements for specific machines

   HINT: Check the Standards before your presentation for any added general safety rules, and for specific guarding requirements for the machinery at your job site.

2. DISCUSS each of the General Safety Rules

   Rule 1 Refer back to "Hazards that Require Guards", if needed

   Ask participants to give examples of guards that protect against hazardous actions, motions, and locations

   Emphasize the NOTE

   Rule 2 Explain your system for marking all danger zones

   State that danger zones must be visible and clear of obstructions

   Rule 3 Refer back to "Basic Information for Machine Operators", if needed

   Rule 4 Explain how the manuals at your job site can help operators prevent accidents

   Rule 5 Show examples of proper protective equipment

   Emphasize the CAUTION

   Rule 6 Explain your company's policies for removing or changing machine guards (such as during maintenance, etc.)

   Rule 7 Refer back to "Supplemental Safety Devices", if needed

   Explain the difference between a safety device and a machine guard

   Emphasize the NOTE

GUARDING

GENERAL SAFETY RULES

NOTE: Follow all OSHA guidelines.

1. USE the proper guards for the hazardous actions, motions, and locations of machines

   NOTE: Machines have no feelings. You must be aware of potentially unsafe situations and take any necessary precautions.

2. OBSERVE all marked danger zones on and around machines

   NOTE: Also keep marked danger zones clear and easy to see, for yourself and for others.

3. KNOW how to operate your machines with their guards in place and with any safety devices

   NOTE: You should also know the proper emergency procedures to follow on the job, in case of accident, injury, or other emergency.

4. READ all instruction manuals for machinery -- especially safety sections -- before operating any machine

5. WEAR the proper types of personal protective equipment

   CAUTION: DO NOT WEAR ANY ITEM THAT ITSELF CAN CREATE A HAZARD AROUND A MACHINE.

6. DO NOT CHANGE OR REMOVE the guards in place on machines and tools

   NOTE: Guards must be in place to be effective.

7. USE supplemental safety devices in addition to the correct types of guards

   NOTE: Never substitute safety devices for the proper machine guards.

GUARDING
SELF-TEST 1

Match the definitions to the term each describes.

_____1. The parts or surfaces of a machine that can catch on clothing or other materials due to rough edges, sharp corners or points, unusual shapes, or rough-textured surfaces

_____2. The points where two objects are in contact with each other and are rotating inward

_____3. The points where two or more moving parts of a machine or tool come together

_____4. The point on a tool or machine where the work is performed on the stock or material

_____5. The points where two moving parts of a machine or tool pass each other closely with a scissor-like action

a. Pinch points

b. Catch points

c. Point of operation

d. Shear points

e. Nip points

GUARDING
SELF-TEST 2

1. Which type of guard provides the most protection?

   a. Fixed Enclosure
   b. Interlocking Enclosure
   c. Adjustable
   d. Self-Adjusting

2. Which of the following is NOT a safeguarding action of an interlocking enclosure guard?

   a. Stop power when guard is in open position or is removed
   b. Guard danger zones until the guard is back in place
   c. Provide a barrier that can be adjusted for a variety of operations
   d. Stay closed until the guarded part stops

3. Which type of guard is the first alternative to fixed enclosure guards?

   a. Adjustable guards
   b. Interlocking Enclosure guards
   c. Self-Adjusting guards
   d. Holding tools

4. Self-adjusting guards

   a. restrain bursting or breaking machine parts
   b. stop power when guard is in open position or is removed
   c. prevent access to dangerous machine parts at all times by enclosing hazardous operations completely
   d. provide a barrier that moves according to the size of the stock entering the danger area

GUARDING
SELF-TEST 3

1. Which of the following is NOT true of an adjustable guard?

   a. Can admit different sizes of stock
   b. Operator can make the guard ineffective
   c. May not offer complete protection at all times
   d. Can offer maximum protection
   e. Can be built for specific uses

2. All of the following are advantages of a fixed enclosure guard EXCEPT

   a. Can be built for specific uses
   b. Allow for different sizes of stock by admitting the stock as the operator moves the stock into a danger zone
   c. Can offer maximum protection
   d. Usually requires minimum maintenance
   e. Can operate with high production and repetitive operations

3. Which of the following is a disadvantage of both adjustable guards and self-adjusting guards?

   a. May interfere with the operator's visibility
   b. May be easy to disengage
   c. Operator can make the guard ineffective
   d. May be limited only to specific operations

GUARDING
SELF-TEST 4

1. Which of the following is a safeguarding action of a photoelectric safety device?
   - a. Prevents the operator from reaching into the danger zone
   - b. Prevents the machine from cycling when light field is broken
   - c. Prevents the machine from cycling when movement of the contact bar or probe is interrupted
   - d. Keeps the operator's hands away from the point of operation when the machine's cycle begins

2. The safety device that moves a specified distance between the operator and the danger zone is called
   - a. Holdback (restraint)
   - b. Trip Control
   - c. Electromechanical
   - d. Two-Hand Trip

3. A trip control can be a
   - a. body bar
   - b. triprod
   - c. tripwire
   - d. all of the above
   - e. none of the above

4. Which of the following is NOT a safeguarding action of a two-hand trip device?
   - a. Moves a specified distance between the operator and the danger zone
   - b. Prevents the machine from cycling when capacitance field is broken
   - c. Stops the machine when activated by either of the operator's hands
   - d. Pulls the operator's hands back from the danger zone as the machine starts to cycle
   - e. All of the above

GUARDING
SELF-TEST 5

1. Supplemental safety devices used to feed stock into a saw blade are

   a. holding tools
   b. push stick and push block
   c. transparent shields
   d. awareness barriers

2. Supplemental safety devices that remind you that you are approaching a danger zone are

   a. awareness barriers
   b. transparent shields
   c. holding tools
   d. push sticks and push blocks

3. A supplemental safety device used to place or remove stock is a

   a. awareness barrier
   b. transparent shield
   c. holding tool
   d. push stick and push block

4. A supplemental safety device that can protect you from flying particles, splashes, or splatters is a

   a. awareness barrier
   b. transparent shield
   c. holding tool
   d. push stick and push block

GUARDING
ANSWERS TO SELF-TESTS

NOTE: Check the appropriate pages in this unit for more information or explanations.

SELF-TEST 1

1. b; 2. e; 3. a; 4. c; 5. d

SELF-TEST 2

1. a; 2. c; 3. b; 4. d

SELF-TEST 3

1. d; 2. b; 3. a

SELF-TEST 4

1. b; 2. c; 3. d; 4. e

SELF-TEST 5

1. b; 2. a; 3. c; 4. b

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Hazardous Materials

Hazardous Materials

Hazardous Materials

Hazardous Materials

Hazardous Materials

Hazardous Materials

Hazardous Materials

Hazardous Materials

Hazardous Materials

INSTRUCTOR'S GUIDELINES

OBJECTIVE: The objective of this presentation is to instruct participants in some basic concepts of hazard communications, including types of hazards, routes of entry, material safety data sheets, and hazard warning systems. This presentation is not intended to replace any existing training program in hazard communications, and does not represent a complete training program in hazard communications or the handling of hazardous materials.

1. USE this unit as a source of supplemental safety training in hazard communications

2. ORDER or OBTAIN supplemental training materials for your presentation

    a. Films and videotape

        (1) Material Safety Data Sheet/Chemical Safety. Color, 25 minutes, VHS. Available from TPC Training Systems.

        (2) Types of Chemical Hazards. Color, 25 minutes, VHS. Available from TPC Training Systems.

        (3) Hazard Communication. Color, 20 minutes, VHS. Available from Summit Training Source, Inc., 6504 28th Street, S.E., Grand Rapids, MI 49506

        (4) Container Labeling. Color, 15 minutes, VHS. Available from Summit Training Source, Inc., 6504 28th Street, S.E., Grand Rapids, MI 49506

    b. Written materials

        (1) 29 CFR 1910 of the OSHA General Industry Safety and Health Standards

        NOTE: You must supplement 29 CFR 1910 with the Federal Register of August 24, 1987. This contains the Final Rule for Hazard Communication.

        (2) Fire Protection Handbook (Current Edition), from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

    c. Chalkboard, flip chart, chalk, marking pens, etc.

INSTRUCTOR'S GUIDELINES

3. EXPLAIN or REVIEW your company's safety policies or guidelines for working with or around hazardous materials

   HINT: Make participants aware of hazard communications as it is followed at their job site.

4. ADD the appropriate sections from this unit to your existing program in hazard communications, if possible

5. USE examples of actual labels, chemical information lists, material safety data sheets, and hazard warning systems from your job site to supplement the discussion on each topic

   HINT: Explain and show that these items may vary from one job site to another.

INSTRUCTOR'S GUIDELINES

Introduction

1. GIVE examples of activities on the job that involve hazardous materials

   HINT: A participant may not actually work with a hazardous material, but may be exposed to it.

2. DESCRIBE some example situations where an accident involving hazardous materials includes personal, material, and financial costs (Give examples of each cost)

HAZARDOUS MATERIALS

INTRODUCTION

Importance of safety with hazardous materials

1. Part of Your Job -- Your activities on the job may involve hazardous materials in many forms and many amounts

2. Part of Your Risks -- Hazardous materials introduce risks to you in the form of health hazards and physical hazards

3. Part of the Costs of Accidents -- Job-related injuries and illnesses related to hazardous materials include personal, material and financial costs

INSTRUCTOR'S GUIDELINES

Basic Facts

Fact 1	Explain how hazardous materials affect everyone
Fact 2	Give other examples of materials that are hazardous in some way
Fact 3	Explain that "communication" includes written training programs, labels, material safety data sheets, chemical information lists, and hazard warning systems
Fact 4	Present an example where one participant's failure to act responsibly results in an accident for that participant and for others

HAZARDOUS MATERIALS

BASIC FACTS

FACT 1: DEALING WITH hazardous materials may be a part of your job every day, whether you actively use these materials or supervise other people who must handle them

FACT 2: IDENTIFYING hazardous materials may be hard, since you may not think of many products as "hazardous"

NOTE: A material can be "hazardous" because of the way the material is used. For example, oxygen is highly flammable when used in its "pure" form.

FACT 3: COMMUNICATING information about possible health and physical hazards on the job is important for your safety and the safety of your co-workers

FACT 4: ADOPTING an attitude of responsibility is important to help prevent unnecessary risks and to reduce the necessary risks from using hazardous materials on the job

INSTRUCTOR'S GUIDELINES

Hazard Communication Standard (29 CFR 1910.1200) -- Purpose

1. REFER to 29 CFR 1910.1200 for more information
2. DISCUSS each listed purpose

Hazard Communication Standard -- Requirements for Employee Information

1. REFER to 29 CFR 1910.1200 for more information
2. EXPLAIN how your hazard communications program satisfies the requirements for employee information

HAZARDOUS MATERIALS

HAZARD COMMUNICATION STANDARD
(29 CFR 1910.1200)

Purpose*

To guarantee that

1. Hazards of all chemicals produced or imported are evaluated
2. Information about the hazards of chemicals is transmitted to affected employers and employees
3. Comprehensive programs in hazard communications transmit information about the hazards of chemicals to affected employers and employees

Requirements for Employee Information

Employees must be informed of

1. Requirements of this section
2. Any operations in their work area where hazardous chemicals are present
3. The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and material safety data sheets required by this section

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*See 29 CFR 1910.1200 (a-b) for more information.

INSTRUCTOR'S GUIDELINES

Hazard Communication Standard -- Requirements for Employee Training (Minimum Requirements)

1. DESCRIBE the topics covered in your company's program for hazard communications, in addition to the minimum requirements

2. SHOW how your company goes beyond the minimum requirements

HAZARD COMMUNICATION STANDARD
(29 CFR 1910.1200)

Requirements for Employee Training
(Minimum Requirements)

1. Methods and observations for detecting the presence or release of a hazardous chemical in the work area

   EXAMPLES: Monitoring by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.

2. Physical and health hazards of the chemicals in the work area

3. Protective measures for employees to protect themselves from the physical and health hazards of the chemicals in the work area, including the specific procedures that the employer has used to protect employees from exposure to hazardous chemicals

   EXAMPLES: Appropriate work practices, emergency procedures, personal protective equipment.

4. Details of the employer's hazard communication program, including explanations of the labeling system, the Material Safety Data Sheet, and ways for employees to obtain and use the appropriate hazard information

INSTRUCTOR'S GUIDELINES

Terms in Hazard Communications

1. DISCUSS the terms and definitions

2. GIVE examples of each term at your job site

   EXAMPLES: An example of a "container," "hazardous chemical," "work area," etc., as defined and present at your job site.

3. REFER to 29 CFR 1910.1200 for more definitions

4. READ through the list of "Common Acronyms"

   HINT: This list is not complete. Add any other acronyms as needed.

HAZARDOUS MATERIALS

TERMS IN HAZARD COMMUNICATIONS

NOTE: See 29 CFR 1910.1200 for other definitions.

1. CAS Number -- the unique identification number given to chemicals by the Chemical Abstracts Service

2. Chemical Name -- the scientific designation of a chemical in accordance with the naming system developed by the International Union of Pure and Applied Chemistry (IUPAC), or the Chemical Abstract Service (CAS) naming system, or a name that will clearly identify the chemical for the purpose of conducting a hazard evaluation

3. Common Name -- any designation or identification used to identify a chemical other than by its chemical name

   EXAMPLES: Trade name or number, code name or number, brand name, generic name.

4. Container -- any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical

5. Distributor -- a business, other than a chemical manufacturer or importer, which supplies hazardous chemicals to other distributors or to employers

6. Employee -- a worker who may be exposed to hazardous chemicals under normal operating conditions or foreseeable emergencies

7. Employer -- a person engaged in a business where chemicals are either used, distributed, or are produced for use or distribution, including a contractor or subcontractor

8. Hazardous Chemical -- any chemical which is a physical hazard or a health hazard

HAZARDOUS MATERIALS

TERMS IN HAZARD COMMUNICATIONS

NOTE: See 29 CFR 1910.1200 for other definitions.

9. Health Hazard -- See 29 CFR 1910.1200. For examples of health hazards, see the chart "Two Kinds of Hazards" in this unit

10. Mixture -- any combination of two or more chemicals if the combination is not, in whole or in part, the result of a chemical reaction

11. Physical Hazard -- a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive

    For examples of physical hazards, see the chart "Two Kinds of Hazards" in this unit

12. Work Area -- a room or defined space in a workplace where hazardous chemicals are produced or used, and where employees are present

13. Workplace -- an establishment, job site, or project at one geographical location containing one or more work areas

HAZARDOUS MATERIALS

TERMS IN HAZARD COMMUNICATIONS

Common Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
CAS	Chemical Abstracts Service
CFR	Code of Federal Regulations
CIL	Chemical Information List
IARC	International Agency for Research on Cancer
LEL	Lower Explosive Limit
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
TLV	Threshold Limit Value
UEL	Upper Explosive Limit

INSTRUCTOR'S GUIDELINES

Two Kinds of Hazards

1. DISCUSS the listed examples of each type of hazard

2. ASK participants to suggest other examples of physical and health hazards at their job site

   HINT: Correct any wrong suggestions.

3. REFER to 29 CFR 1910.1200 for the definitions of each hazard, if needed

   HINT: Try to show how the two hazards are different by comparing examples of each hazard.

HAZARDOUS MATERIALS

TWO KINDS OF HAZARDS

NOTE: This list is not complete.

Physical Hazards

Type*	Examples
Combustible liquids	Diesel fuel
Compressed gases	Oxygen, chlorine, acetylene
Explosives	Dynamite, nitroglycerine
Flammable liquids	Gasoline, paint thinner
Flammable solids	Magnesium, sodium, calcium
Organic peroxides	Calcium hypochlorate, HTH (swimming pool bleach)
Oxidizers	Sulfuric acid, hydrogen peroxide
Pyrophoric materials	Potassium, wet magnesium
Reactive (Unstable)	Anhydrous ammonia, methylethylketone peroxide (plastic hardener)
Water-reactive materials	Sodium, potassium, sodium peroxide, burning magnesium

*See 29 CFR 1910.1200 for definitions.

HAZARDOUS MATERIALS

TWO KINDS OF HAZARDS

NOTE: This list is not complete.

Health Hazards

Type*	Examples
Carcinogens	Asbestos, benzene (gas), coke oven emissions
Corrosives	Acids and bases (hydroxides)
Hepatotoxins	Dioxane, acetates, TNT, carbontetrachloride
Highly toxic agents	Hydrogen cyanide, dioxin, pesticides
Irritants	Gasoline, formaldehyde, ketones, sulfuric acid fumes
Nephrotoxins	Acetates, chloroform, mercury, carbon disulfide
Neurotoxins	Mercury, tetraethyl lead (some gasolines), carbonates
Reproductive toxins	Lead, mercury, ethyl alcohol, carbontetrachloride
Sensitizers	Affects immune response -- grain dust, polyvinyl chloride (PVC) Affects pulmonary system -- wood pulp dust, enzyme-based detergents Affects skin -- creosote, formaldehyde, formic acid
Toxic agents	Pesticides, herbicides, paint removers and disinfectants with phenyl elements

PLUS agents that damage lungs, skin, eyes, mucous membranes, and hematopoietic systems (involved in the formation of blood cells)

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*See 29 CFR 1910.1200 for definitions.

INSTRUCTOR'S GUIDELINES

Types of Exposure

1. EXPLAIN that hazard communications is important in preventing cases of exposure to hazardous materials, and in reducing the chances for potential exposure
2. IDENTIFY the possibilities for exposure and potential exposure at your job site

HAZARDOUS MATERIALS

TYPES OF EXPOSURE

NOTE: Defined in 29 CFR 1910.1200.

1. Exposure

   [When] an employee is subjected to a hazardous chemical in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.), and includes potential exposure

2. Potential Exposure

   Accidental or possible exposure

INSTRUCTOR'S GUIDELINES

Routes of Entry

1. DISCUSS the routes of entry and the examples of each

   HINT: Give examples of each route of entry possible at your job site.

2. STATE the precautions that each participant should take

   HINT: These precautions should be specific to your job site and follow your company's policies.

3. DESCRIBE possible situations in different work areas, involving the presence of hazardous materials, and ask participants to identify the route(s) of entry that exist for each situation

HAZARDOUS MATERIALS

ROUTES OF ENTRY

Route	Examples	Precautions*
Inhalation	Breathing mists, dust, vapors, particles	Use adequate and proper ventilation Wear personal protective equipment such as respirators, gloves
Absorption	Being exposed to a hazardous material through the skin	Wear personal protective equipment such as gloves Keep hazardous substances in designated areas only Clean up spills and leaks immediately Avoid direct contact with a hazardous material -- wash thoroughly after contact
Ingestion	Swallowing something that has become contaminated Touching the mouth with a hand after contact with a hazardous substance	Keep hazardous substances in designated areas only Wear personal protective equipment such as gloves Wash thoroughly after contact and before touching anything Allow no food items in work areas with hazardous substances

*Examples of possible solutions only. Always check the Material Safety Data Sheet for specific precautions to take.

INSTRUCTOR'S GUIDELINES

Material Safety Data Sheet -- Questions About the MSDS

1. DISCUSS each question and answer

2. ANSWER each question as it relates to your job site

   EXAMPLE: For Question #5, explain where each participant can get the MSDSs at your job site.

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Questions About the MSDS

1. What is the MSDS?

   The MSDS is the Material Safety Data Sheet for a hazardous chemical. Each MSDS supplies information about the characteristics of the hazardous chemical, the physical and health hazards associated with the chemical, precautions for safe handling and use of the chemical, and other information

2. Who is responsible for getting each MSDS?

   Chemical manufacturers and importers must obtain or develop a MSDS for each hazardous chemical that they produce or import

   Employers must have a MSDS for each hazardous chemical that they use

3. How can I use a MSDS?

   You can use the MSDS for a chemical to find out about the physical hazards and the health hazards of working with the chemical before you work with it

   The MSDS will tell you how to handle and use the hazardous chemical safely

4. What information is required on a MSDS?

   a. The identity of the chemical used on the label (single substance or mixture)

   b. Physical and chemical characteristics of the hazardous chemical (such as vapor pressure, flash point, etc.)

   c. Physical hazards of the hazardous chemical (including the potential for fire, explosion, and reactivity)

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Questions About the MSDS

d. Health hazards of the hazardous chemical (including the signs and symptoms of exposure, and any medical conditions that are generally recognized as being aggravated by exposure to the chemical)

e. Primary route(s) of entry

f. The OSHA permissible exposure limit , the ACGIH Threshold Limit Value, and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the MSDS, where available

g. Whether the hazardous chemical is listed in the National Toxicology Program (NTP)Annual Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs, or by OSHA

h. Any generally applicable precautions for safe handling and use that are known to the MSDS preparer, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for clean-up of spills and leaks

i. Any generally applicable control measures that are known to the MSDS preparer, such as appropriate engineering controls, work practices, or personal protective equipment

j. Emergency and first-aid procedures

k. The date of preparation of the MSDS (or the last change to it)

l. The name, address, and telephone number of the chemical manufacturer, importer, employer or other responsible party preparing or distributing the MSDS, who can provide additional information on the hazardous chemical and appropriate emergency procedures, if needed

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Questions About the MSDS

5. Where can I get a MSDS?

   Your employer must keep copies of all required MSDSs for each hazardous chemical in your workplace

   Your employer must make sure that each MSDS is readily accessible during each work shift to employees when they are in their work area(s)

INSTRUCTOR'S GUIDELINES

Material Safety Data Sheet -- MSDS Sections and General Terms

1. For the pages labeled "General Terms," DISCUSS each term and the question(s) each term answers

2. For the sample MSDS sections following each page of "General Terms," SHOW the places on the MSDS where each numbered question can be answered

3. COMPARE each sample MSDS section with an actual MSDS, and show where the numbered questions are answered on the actual MSDSs

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Heading and Manufacturer's Data
General Terms

1. Identity -- The common and trade name of the hazardous material, including any synonyms

   ANSWERS: How is this chemical referred to? How many names exist for this chemical?

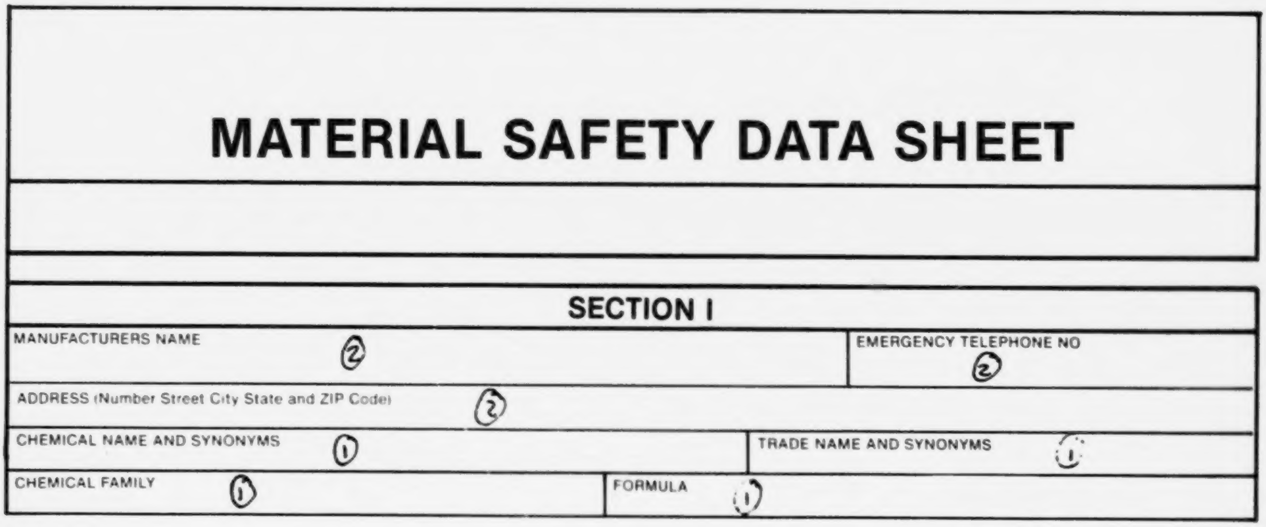
2. Manufacturer's Data -- Name, address, and telephone number(s) of the substance manufacturer, including an information number and an emergency number. May also include the date the MSDS was prepared or revised, and the signature of the preparer

   ANSWERS: Who is responsible for preparing or distributing this MSDS? Who can I contact for more information about this chemical and about any emergency procedures to follow?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Heading and Manufacturer's Data



MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURERS NAME ②	EMERGENCY TELEPHONE NO ②
ADDRESS (Number Street City State and ZIP Code) ②	
CHEMICAL NAME AND SYNONYMS ①	TRADE NAME AND SYNONYMS ①
CHEMICAL FAMILY ①	FORMULA ①

1. How is this chemical referred to?
   How many names exist for this chemical?

2. Who is responsible for preparing or distributing this MSDS?
   Who can I contact for more information about this chemical and about any emergency procedures to follow?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Hazardous Ingredients
General Terms

1. Hazardous Components -- The chemical and common name of hazardous ingredients, including all synonyms

   ANSWERS: Is this chemical a mixture? What are the hazards of the individual ingredients?

2. PEL -- Permissible Exposure Limit, or the concentration of a chemical to which you may be exposed without ill effects for 8 hours daily, 40 hours per week, for the rest of your career. PEL is expressed in parts per million (ppm), parts per billion (ppb), or milligrams per cubic meter (mg/m3). PEL is the exposure limit set by OSHA

   NOTE: The Permissible Exposure Limit can vary from one person to another, depending on habits of personal hygiene, smoking, and other factors. The PEL for one person may not be the same as the PEL for another person.

   ANSWERS: How much of this chemical can I be exposed to 8 hours per day, 40 hours per week, for the rest of my career without any ill effects?

3. TLV -- Threshold Limit Value, or the concentration of a chemical to which you may be exposed without ill effects for 8 hours daily, 40 hours per week, for the rest of your career. TLV is the permissible exposure limit used by the American Conference of Governmental Industrial Hygienists (ACGIH)

   ANSWERS: How much of this chemical can I be exposed to 8 hours per day, 40 hours per week, for the rest of my career without any ill effects?

4. Percent (%) -- The percentage of the total substance accounted for by a hazardous ingredient

   ANSWERS: How much of this substance is made of a hazardous ingredient?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Hazardous Ingredients
General Terms

5. Other Limits -- Limits recommended by the manufacturer or importer of the hazardous substance

   ANSWERS: What other limits should I know about?

6. CAS Number -- Chemical Abstracts Service number that specifically identifies chemicals

   ANSWERS: How can I find the specific chemical name of this substance as it is identified by the Chemical Abstracts Service?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Hazardous Ingredients

SECTION II — HAZARDOUS INGREDIENTS

	CAS #	%	TLV (Units)
①	⑥	④	② ③
⑤			

1. Is this chemical a mixture?
   What are the hazards of the individual ingredients?

2. How much of this chemical can I be exposed to 8 hours per day, 40 hours per week, for the rest of my career without any ill effects?

3. Same as 2

4. How much of this substance is made of a hazardous ingredient?

5. What other limits should I know about?

6. How can I find the specific chemical name of this substance as it is identified by the Chemical Abstracts Service?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Physical/Chemical Data
General Terms

1. Boiling Point -- The temperature at which a liquid changes to a vapor, usually given in degrees Fahrenheit at the sea-level pressure of 14.70 psi (760 millimeters of mercury)

   ANSWERS: At what temperature will this chemical change to a vapor (to become a possible inhalation hazard)?

2. Vapor Pressure -- The pressure exerted by a saturated vapor -- a vapor at the temperature of the boiling point corresponding to its pressure -- above its own liquid, expressed in millimeters of mercury (Hg). Usually, the higher the vapor pressure, the faster the liquid will enter the air

   ANSWERS: How fast does this chemical enter the air (to become a possible inhalation hazard)?

3. Vapor Density -- The ratio of the density of a volume of vapor to the density of an equal volume of air. Air has a vapor density of (1). Vapors with a density less than (1) rise in air, while those with a density greater than (1) sink

   ANSWERS: Will this chemical as a vapor rise or sink in the air? (If the vapor rises in air, then it could become a possible inhalation hazard.)

4. Specific Gravity -- The ratio of the weight of a volume of material compared to the weight of an equal volume in water. Water has a specific gravity of (1). Liquids and solids with a specific gravity less than (1) float on water, while those with a specific gravity greater than (1) sink

   ANSWERS: Will this chemical float on water or sink?

MATERIAL SAFETY DATA SHEET

Physical/Chemical Data
General Terms

5. Evaporation Rate -- The rate at which a substance will vaporize, compared to the rate of vaporization of a known substance such as butyl acetate

   ANSWERS: How fast does this chemical enter the air (to become a possible inhalation hazard)?

6. Solubility in Water -- The amount of a substance that can be dissolved in a given volume of water, usually expressed as milligrams per liter (mg/l)

7. Appearance and Odor -- The appearance and/or odor of the substance

   ANSWERS: Can I detect this chemical by the way it looks and/or by the way it smells?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Physical/Chemical Data

SECTION III — PHYSICAL/CHEMICAL DATA			
BOILING POINT (°)	①	SPECIFIC GRAVITY (H_2O = 1)	④
VAPOR PRESSURE (MM HG)	②	PERCENT VOLATILE BY VOLUME (%)	
VAPOR DENSITY (AIR = 1)	③	EVAPORATION RATE (________ = 1)	⑤
SOLUBILITY IN WATER	⑥	pH	
APPEARANCE AND ODOR ⑦			

1. At what temperature will this chemical change to a vapor (to become a possible inhalation hazard)?

2. How fast does this chemical enter the air (to become a possible inhalation hazard)?

3. Will this chemical as a vapor rise or sink in the air? (If the vapor rises in air, then it could become a possible inhalation hazard.)

4. Will this chemical float on water or sink?

5. How fast does this chemical enter the air (to become a possible inhalation hazard)?

6. Can this chemical be mixed in water?

7. Can I detect this chemical by the way it looks and/or by the way it smells?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Fire and Explosion Hazards
General Terms

1. Flash Point -- The lowest temperature at which a liquid will ignite in the presence of a flame, but will not continue to burn. Usually expressed in degrees Fahrenheit. Should also indicate the method of determining the flash point, since different methods result in different figures

   The lower the flash point, the higher the flammability of the liquid

   ANSWERS: How flammable is this chemical as a liquid? How soon will the liquid burst into flame (become a possible fire and explosion hazard) in the presence of an ignition source?

2. Flammable (Explosive) Limits -- The range over which a vapor mixed with air will flash or explode in the presence of an ignition source (instead of burning). The range is between the LEL (Lower Explosive Limit) and the UEL (Upper Explosive Limit). LEL and UEL show the lowest and the highest amount of a chemical (percentage) in a mixture of the chemical with the air, that will cause the mixture to be explosive (See below)

   Higher Hazard if

   1. Chemical has a low LEL -- A small amount of the chemical in air can explode

   2. Chemical has a wide range between LEL and UEL -- Chemical in air can explode under many conditions

   Lower Hazard if

   1. Chemical has a narrow range between LEL and UEL -- Chemical in air can explode only under certain conditions

   ANSWERS: How explosive is this chemical in air?

MATERIAL SAFETY DATA SHEET

Fire and Explosion Hazards
General Terms

3. Extinguishing Media -- Substances needed to control the hazardous material in case of fire. Uses generic names such as water, sand, fog, foam, dry chemical, etc

   ANSWERS: What equipment do I need to put out a fire that involves this chemical?

4. Special Firefighting Procedures -- The "substance-specific" procedures to follow to control a fire emergency

   ANSWERS: What should I do (and not do) when responding to a fire that involves this chemical?

5. Unusual Fire/Explosion Hazards -- Any fire hazards from burning or overheating the hazardous material, such as chemical reactions, changes in the material's composition, or other hazards in extinguishing the fire

   ANSWERS: What other hazards could result if this chemical burns or explodes?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Fire and Explosion Hazards

SECTION IV — FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) ①	FLAMMABLE LIMITS ②	LEL	UEL
EXTINGUISHING MEDIA ③			
SPECIAL FIRE FIGHTING PROCEDURES ④			
UNUSUAL FIRE AND EXPLOSION HAZARDS ⑤			

1. How flammable is this chemical as a liquid?
   How soon will the liquid burst into flame (to become a possible fire and explosion hazard) in the presence of an ignition source?
2. How explosive is this chemical in air?
3. What equipment do I need to put out a fire that involves this chemical?
4. What should I do (and NOT do) when responding to a fire that involves this chemical?
5. What other hazards could result if this chemical burns or explodes?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Health Hazards
General Terms

1. Route(s) of Entry -- Can the chemical be (1) inhaled, (2) absorbed through the skin, or (3) ingested?

   ANSWERS: Can this chemical be a health hazard if I inhale, absorb, or eat it somehow?

2. Health Hazards -- Any acute (short-term) or chronic (long-term) health hazards associated with the chemical

   ANSWERS: Can this chemical have any possible short-term or long-term health effects?

3. Carcinogen -- If the chemical is a carcinogen (cancer-causing), based on ratings from

   National Toxicology Program (NTP), Annual Report on Carcinogens (latest edition), or

   International Agency for Research on Cancer (IARC), Monographs (latest editions), or

   Occupational Safety and Health Administration (OSHA),29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances

   NOTE: The National Institute for Occupational Safety and Health (NIOSH) publishes the Registry of Toxic Effects of Chemical Substances. The Registry indicates whether a chemical has been found to be a potential carcinogen by NTP or IARC.

   ANSWERS: Could this chemical cause cancer?

4. Signs/Symptoms of Exposure -- The most common signs or symptoms of overexposure to the hazardous material. Includes signs and symptoms from both acute and chronic exposure

   ANSWERS: What are possible signs of short-term and long-term overexposure to this chemical?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Health Hazards
General Terms

5. Emergency/First-Aid Procedures -- The "substance-specific" emergency and first-aid procedures for treating cases of overexposure to the hazardous material

   ANSWERS: What first-aid or emergency procedures should I follow in case of overexposure to this chemical?

6. Medical Conditions -- Any medical conditions that may be aggravated or worsened due to overexposure to the hazardous material

   ANSWERS: Do I have any medical conditions that could be aggravated or worsened if I am overexposed to this chemical?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Health Hazards

SECTION V — HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	②
EFFECTS OF OVEREXPOSURE	① ③ ④ ⑥
EMERGENCY AND FIRST AID PROCEDURES	⑤

1. Can this chemical be a health hazard if I inhale, absorb, or ingest it somehow?

2. Can this chemical have any possible short-term or long-term health effects?

3. Could this chemical cause cancer?

4. What are possible signs of short-term and long-term overexposure to this chemical?

5. What first-aid or emergency procedures should I follow in case of overexposure to this chemical?

6. Do I have any medical conditions that could be aggravated or worsened if I am overexposed to this chemical?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Reactivity Hazards
General Terms

1. Stability -- Indicates whether a chemical is stable or unstable under normal conditions, and includes any conditions to avoid

   ANSWERS: Under what conditions is this chemical stable and unstable? What conditions should I avoid?

2. Incompatibility -- Any materials that should not be in contact with the chemical

   ANSWERS: What materials should I keep away from this chemical?

3. Hazardous Decomposition/By-Products -- Any hazardous substances produced by the hazardous material as a result of burning, reacting with other substances, or other processes

   ANSWERS: What other hazardous substances could be created by this chemical, and under what conditions?

4. Hazardous Polymerization -- The change in energy level when two or more molecules of the hazardous material combine to form a repeating structural unit. Includes any conditions to avoid

   ANSWERS: What could happen if the chemical changes, and under what conditions could it change?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Reactivity Hazards

SECTION VI — REACTIVITY DATA

STABILITY	UNSTABLE	①	CONDITIONS TO AVOID ①
	STABLE	①	
INCOMPATABILITY (Materials to avoid)		②	
HAZARDOUS DECOMPOSITION PRODUCTS		③	
HAZARDOUS POLYMERIZATION	MAY OCCUR	④	CONDITIONS TO AVOID ④
	WILL NOT OCCUR	④	

1. Under what conditions is this chemical stable and unstable? What conditions should I avoid?
2. What materials should I keep away from this chemical?
3. What other hazardous substances could be created by this chemical, and under what conditions?
4. What could happen if the chemical changes, and under what conditions could it change?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Control Measures
General Terms

1. Respiratory Protection -- The types of required breathing protection when using the chemical

   ANSWERS: What kinds of respiratory equipment must I use with this chemical (such as respirator, gas mask, hood, suit, etc.)?

2. Ventilation -- The types of required ventilation around the chemical, such as local exhaust, mechanical, special, or other forms of ventilation

   ANSWERS: Are special types of ventilation required in areas where this chemical is used?

3. Eye Protection -- The types of required eye protection when using the chemical

   ANSWERS: What kinds of eye protection must I use with this chemical (such as goggles, face shield, etc.)?

4. Protective Gloves -- The types of protective gloves required when using the chemical

   ANSWERS: What kinds of gloves must I use with this chemical (such as for protection against chemical reactions, extreme heat or cold, etc.)?

5. Work/Hygienic Practices -- The proper work and good health practices to follow when using the chemical

   ANSWERS: What good health practices should I follow to help control the hazards from working with this chemical?

6. Other -- Any other kinds of protective clothing or equipment required or recommended when using the chemical

   ANSWERS: Are other kinds of equipment and/or protective clothing needed when using this chemical?

NOTE: Using tobacco or smoking can affect your exposure to a hazardous chemical.

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Control Measures

SECTION VII — CONTROL MEASURES

RESPIRATORY PROTECTION (Security type) ①		
VENTILATION	LOCAL EXHAUST ②	SPECIAL ②
	MECHANICAL (General) ②	OTHER ②
PROTECTIVE GLOVES ④	EYE PROTECTION ③	
OTHER PROTECTIVE EQUIPMENT ⑤ ⑥		

1. What kinds of respiratory equipment must I use with this chemical?
2. Are special types of ventilation required in areas where this chemical is used?
3. What kinds of eye protection must I use with this chemical?
4. What kinds of gloves must I use with this chemical?
5. What good health practices should I follow to help control the hazards from working with this chemical?
6. Are other kinds of equipment and/or protective clothing needed when using this chemical?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Special Precautions or
Precautions for Safe Handling and Use
General Terms

1. Spill/Leak Procedures -- Methods for controlling spills and leaks involving the chemical, including the equipment needed and any precautions to take

   ANSWERS: How should I control a spill or leak that involves this chemical?

2. Waste Disposal Method -- The permissible and the prohibited method(s) for disposing of the hazardous waste created by the chemical during operations and processes

   ANSWERS: How can I safely dispose of any waste products from this chemical?

3. Handling/Storing Precautions -- Any special handling and/or storage precautions to take with the hazardous material

   ANSWERS: How should I safely handle and store this chemical?

4. Other Precautions -- Any other precautions to take when using the hazardous material

   ANSWERS: Should I follow any other precautions with this chemical?

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

Special Precautions or Precautions for Safe Handling and Use

SECTION VIII — SPECIAL PRECAUTIONS	
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	③
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	①
WASTE DISPOSAL METHOD	②
OTHER PRECAUTIONS	④

1. How should I control a spill or leak that involves this chemical?
2. How can I safely dispose of any waste products from this chemical?
3. How should I safely handle and store this chemical?
4. Should I follow any other precautions with this chemical?

INSTRUCTOR'S GUIDELINES

Material Safety Data Sheet -- General Safety Rules

Rule 1 Explain your company policy for access

Rule 2 Emphasize this rule

Rule 3 Use an actual MSDS to show how to use the MSDS before using a chemical

Rule 4 Give examples from several MSDSs

Rule 5 Describe possible emergency situations and the required preventive steps

Ask participants to explain their responses to possible emergency situations that you describe

Rule 6 Explain that if a participant has a question about a hazardous chemical, that person should find the answer before using the chemical

Emphasize the CAUTION

HAZARDOUS MATERIALS

MATERIAL SAFETY DATA SHEET

General Safety Rules

1. KNOW your company policy for access to MSDSs

   NOTE: Do you know where MSDSs are filed? Do you know the steps to follow at your job site for access to MSDSs?

2. CHECK the MSDS for a hazardous chemical before you use the chemical

   NOTE: Use the MSDS to prevent accidents with hazardous chemicals, as well as to respond safely to an emergency situation that involves the chemical.

3. IDENTIFY the hazards of working with or handling a hazardous chemical

   NOTE: Identify the health hazards and the physical hazards.

4. FOLLOW the warnings and guidelines stated on each MSDS

   NOTE: Know the characteristics of the hazardous chemical and any precautions to take before you handle the chemical.

5. PLAN any emergency procedures in advance for the hazardous chemical(s) that you will use

   NOTE: Use the MSDS to plan your response to any possible emergency situations involving the chemical.

6. REFER to each MSDS for the hazardous chemicals in your work area(s) as often as necessary

   CAUTION: DO NOT WAIT FOR AN ACCIDENT TO HAPPEN BEFORE CHECKING THE MSDS.

INSTRUCTOR'S GUIDELINES

Chemical Information List -- Definition and OSHA Requirements

1. DISCUSS the "Definition" of a Chemical Information List and the "OSHA Requirements"

2. SHOW how your company meets or exceeds the OSHA requirements

HAZARDOUS MATERIALS

CHEMICAL INFORMATION LIST

Definition

Chemical Information List -- Written record of all of the hazardous chemicals present at your job site. The Chemical Information List (CIL) provides valuable information to you and to fire fighters about the type and the location of the materials classified as hazardous that are present at your job site

OSHA Requirements

Your Chemical Information List must

1. List the hazardous chemicals known to be present at your job site
2. Use an identity [for the chemical] that is referenced on the appropriate MSDS
3. Apply to the job site as a whole or to individual work areas

NOTE: The Chemical Information List should record all of the hazardous chemicals for which you have a MSDS, and you should have a MSDS for every hazardous chemical on the Chemical Information List.

INSTRUCTOR'S GUIDELINES

Chemical Information List -- General Safety Rules

Rule 1 Give examples of work areas at your job site, and the hazardous chemicals present

Rule 2 Demonstrate the way to use the CIL and MSDS, i.e., find a chemical on the CIL and locate the correct MSDS for needed information

Rule 3 Is this true for your job site?

Rule 4 Explain where CILs are located in each work area and for the job site as a whole

Rule 5 Explain your company policy for updating CILs

HAZARDOUS MATERIALS

CHEMICAL INFORMATION LIST

General Safety Rules

NOTE: Follow all OSHA guidelines for listing hazardous chemicals.

1. IDENTIFY the hazardous chemical(s) in your work area(s) from the CIL

   NOTE: Do you know how hazardous chemicals are listed at your job site (for the job site as a whole or for each work area)?

2. REFER to the appropriate MSDS for any chemical listed on the CIL for your work area(s)

   NOTE: Check the CIL and any MSDSs for hazardous chemicals in your work area(s) before you use the chemical.

3. MATCH the hazardous chemicals listed on the CIL with the MSDSs on file

   NOTE: You should have a MSDS for each hazardous chemical on your CIL. Each chemical with a MSDS should be listed on a CIL.

4. KEEP the CIL for your work area(s) visible at all times

   NOTE: The CIL for each work area tells other persons about the hazardous chemicals and possible hazards that are in the work area.

5. UPDATE any CIL when new hazardous chemicals are added or when a hazardous chemical is removed

   NOTE: Know the current hazards that exist in each work area.

INSTRUCTOR'S GUIDELINES

Labels -- Reasons for Labeling Hazardous Chemicals

1. ASK participants to explain why each listed reason is important for their safety and for the safety of others

   HINT: Can they think of other reasons?

2. ASK for examples from your job site

HAZARDOUS MATERIALS

LABELS

Reasons for Labeling Hazardous Chemicals

1. REQUIRED by law

   NOTE: Labels and other forms of warning are required by 29 CFR 1910.1200(f).

2. IDENTIFIES containers of hazardous chemicals

   NOTE: A "container" is any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical.

3. WARNS about the hazards of a hazardous chemical

4. GIVES the name and address of the responsible party

   EXAMPLES: Chemical manufacturer, importer.

INSTRUCTOR'S GUIDELINES

Labels -- Responsibilities for Labeling

1. SHOW examples of containers and information received from chemical manufacturers, importers, or distributors that meet the three listed responsibilities

2. DESCRIBE your system of labeling that meets the listed responsibilities of employers

3. ASK participants why each responsibility is important

   HINT: For example, what could happen if a label on an incoming container is removed and not replaced?

4. ASK participants about their own responsibilities

LABELS

Responsibilities for Labeling

NOTE: Check the applicable standards and OSHA guidelines.

Chemical Manufacturers, Importers, or Distributors

1. ENSURE that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked with (a) the identity of the hazardous chemical(s), (b) appropriate hazard warnings, and (c) the name and address of the chemical manufacturer, importer, or other responsible party

2. ENSURE that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked in a way that does not conflict with the requirements of the Hazardous Materials Transportation Act and regulations issued under that Act by the Department of Transportation

3. ENSURE that the labels or other forms of warning used meet the requirements of the substance-specific health standard, if the hazardous chemical is regulated by OSHA in a substance-specific health standard

   EXAMPLE: OSHA has specific requirements for asbestos. See 29 CFR 1910.1001(j) for details.

HAZARDOUS MATERIALS

LABELS

Responsibilities for Labeling

NOTE: Check the applicable standards and OSHA guidelines.

Employers

1. ENSURE that each container of hazardous chemicals in the workplace is labeled, tagged or marked with (a) the identity of the hazardous chemical(s) in the container, and (b) appropriate hazard warnings

   EXCEPTION: Employers are not required to label portable containers into which hazardous chemicals are transferred from labeled containers and which are intended only for the immediate use of the employee who performs the transfer.

2. NOT TO REMOVE or DEFACE existing labels on incoming containers of hazardous chemicals

   EXCEPTION: Unless the container is immediately marked with the required information.

3. ENSURE that labels or other forms of warning are legible, in English, and prominently displayed on the container, or readily available in the work area throughout each work shift

   EXCEPTION: Employers having employees who speak other languages may add the information in their language to the material presented, as long as the information is also presented in English.

4. USE (at the employer's choice) signs, placards, process sheets, batch tickets, operating procedures or other written materials instead of affixing labels to individual stationary process containers

HAZARDOUS MATERIALS

LABELS

Responsibilities for Labeling

NOTE: Check the applicable standards and OSHA guidelines.

Employers

NOTE: As long as the alternative method (a) identifies the applicable containers, (b) conveys the identity and appropriate hazard warnings for the hazardous chemical(s) in the container, and (c) gives employees ready access to written materials in their work area throughout each work shift.

5. ENSURE that the labels or other forms of warning used meet the requirements of the substance-specific health standard, if the hazardous chemical is regulated by OSHA in a substance-specific health standard

EXAMPLE: OSHA has specific requirements for asbestos. See 29 CFR 1910.1001(j) for details.

INSTRUCTOR'S GUIDELINES

Labels -- General Safety Rules

Rule 1	Show examples of labels, tags, and other markings Provide participants with information about different chemicals and have participants create sample labels, then review each label as a group
Rule 2	List other examples of specific hazards Ask participants why specific hazard warnings are important, i.e., what could happen if a warning is not specific enough?
Rule 3	Explain (or ask) why this rule is important
Rule 4	Describe possible situations where participants might transfer hazardous chemicals to an unlabeled container or to an empty container that contained a different chemical Show how to re-label the container to reflect its current contents Emphasize the NOTE
Rule 5	Give examples of standards

HAZARDOUS MATERIALS

LABELS

General Safety Rules

NOTE: Follow all OSHA guidelines.

1. LABEL, TAG or MARK all containers of hazardous chemicals

   NOTE: Include the identity of the hazardous chemical(s) in the container and appropriate hazard warnings.

   Chemical Manufacturers, Importers, or Distributors -- Include the name and address of the chemical manufacturer, importer or other responsible party

2. WARN against specific hazards

   EXAMPLES: "Keep away from open flame," "Do not mix with water," etc.

3. REPLACE hard-to-read labels

   NOTE: Do not remove or deface existing labels on incoming containers of hazardous chemicals, unless you immediately mark the container with the required information.

4. RE-LABEL containers filled with hazardous chemicals other than those listed on the original label

   NOTE: Keep the hazards of the hazardous chemical(s) in any container visible.

5. FOLLOW all labeling requirements of any substance-specific health standard that applies to any hazardous chemical

INSTRUCTOR'S GUIDELINES

Hazard Warning Systems -- Hazard Warning Diamond

1. REFER to the NFPA Fire Protection Handbook (Current Edition) before discussing this hazard warning system, if needed

2. DISCUSS the "theory" behind the warning diamond

3. STATE that a "bar" version of this warning system follows the same general theory, except for the arrangement of the diagram

HAZARDOUS MATERIALS

HAZARD WARNING SYSTEMS

Hazard Warning Diamond

1. IDENTIFIES the fire, health, and reactivity hazards of a chemical

2. SHOWS the order of severity of a hazard, using fire divisions on a scale of (0) to (4) with the number (4) indicating a severe hazard and the number (0) indicating no specific hazard

3. USES a "spatial" system of diagrams (a diagram arranged in a specific order) that follows this pattern:

   Health -- Blue, left of diamond

   Flammability -- Red, top of diamond

   Reactivity -- Yellow, right of diamond

   Specific -- Black on white, bottom of diamond

   NOTE: A "specific" hazard usually indicates a substance or chemical's unusual reactivity with water. Other hazards that may be specific for a hazardous material are radioactivity, whether the material is an oxidizer, corrosive, acid, alkali, etc., as well as the proper fire extinguishing agents required or the types of personal protective equipment needed in case of fire or other emergency involving the hazardous material.

INSTRUCTOR'S GUIDELINES

Hazard Warning Systems -- Location of Hazard Warnings

1. REVIEW the four hazard warnings

2. DRAW sample warning diamonds or bars and quiz participants about the location of each hazard on the sign

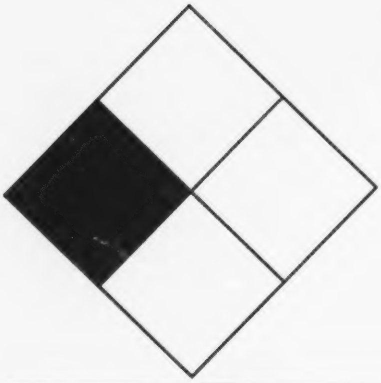
   EXAMPLE: Draw a warning diamond or bar, add the numbers in the spaces, then ask participants to find the number showing (a) the health hazard, (b) the flammability hazard, and (c) the reactivity hazard.

3. EXPLAIN the degrees of hazard -- as the number in each section of the hazard warning system gets bigger, so does the degree of hazard

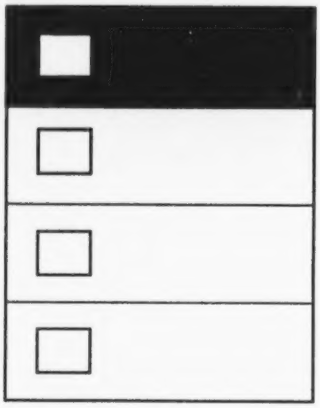
HAZARDOUS MATERIALS

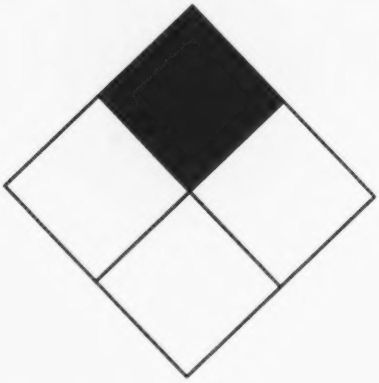
HAZARD WARNING SYSTEMS

Location of Hazard Warnings

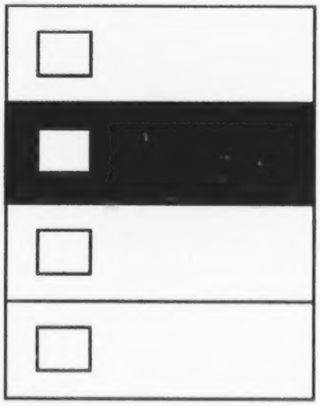


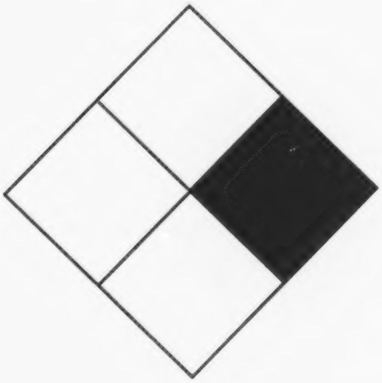
HEALTH (Blue)



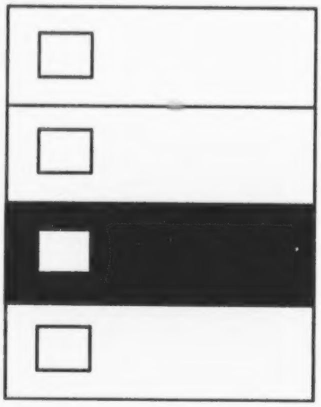


FLAMMABILITY (Red)





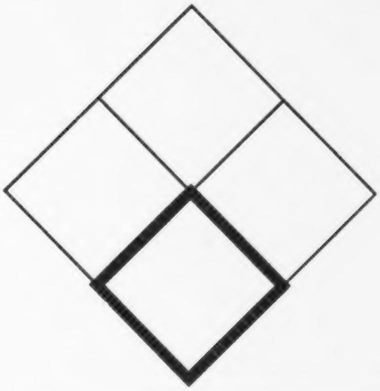
REACTIVITY (Yellow)



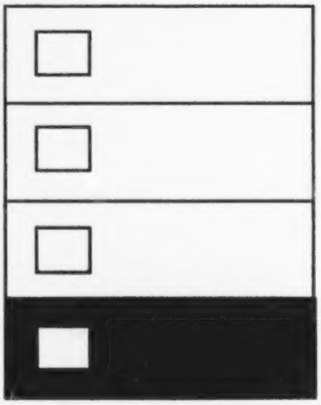
HAZARDOUS MATERIALS

HAZARD WARNING SYSTEMS

Location of Hazard Warnings



SPECIFIC (Black/White)



INSTRUCTOR'S GUIDELINES

Hazard Warning Systems -- Sample Arrangement Variations

1. DISCUSS the arrangement variations

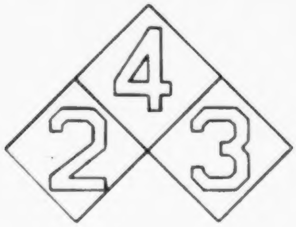
   HINT: Explain the variations found at your job site and on many MSDSs. Also emphasize the NOTE.

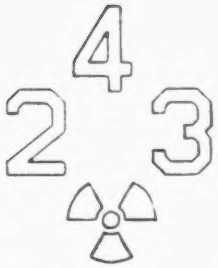
HAZARDOUS MATERIALS

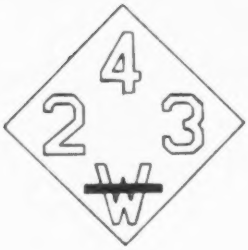
HAZARD WARNING SYSTEMS

Sample Arrangement Variations

NOTE: All hazard warning systems are not the same.







HAZARDOUS MATERIALS
SELF-TEST 1

1. Write out ACGIH.

____

____

2. Write out IARC.

____

____

3. Write out PEL.

____

4. Write out TLV.

____

5. Write out MSDS.

____

6. Write out CFR.

____

7. Write out CAS.

____

HAZARDOUS MATERIALS
SELF-TEST 2

1. All of the following are examples of physical hazards EXCEPT

   a. combustible liquids
   b. carcinogens
   c. explosives
   d. oxidizers

2. All of the following are examples of health hazards EXCEPT

   a. corrosives
   b. highly toxic agents
   c. organic peroxides
   d. neurotoxins
   e. sensitizers

3. List the three (3) routes of entry for hazardous materials.

   a. ____________________________

   b. ____________________________

   c. ____________________________

4. Because you are wearing a poorly-fitting air-purifying respirator under your welding face mask, you are exposed to the welding fumes and later become sick. This is an example of which route of entry?

   a. Absorption
   b. Ingestion
   c. Inhalation
   d. Ventilation

5. You cover your bare hands with motor oil every day on the job. Today, the shop system for ventilation is not working properly. Some dust mixed with particles of a hazardous material from another work area settles on a cinnamon roll that you have left out on the table, to eat during your break. Which route(s) of entry may be present?

   a. Absorption
   b. Ingestion
   c. Inhalation
   d. All of the above
   e. None of the above

HAZARDOUS MATERIALS
SELF-TEST 3

1. The effects of overexposure to a hazardous chemical can usually be found in which general section of a MSDS?

   a. Hazardous Ingredients
   b. Health Hazard Data
   c. Reactivity Data
   d. Physical/Chemical Data

2. The appearance and odor of a hazardous chemical can usually be found in which general section of a MSDS?

   a. Heading and Manufacturer's Data
   b. Health Hazard Data
   c. Control Measures
   d. Physical/Chemical Data

3. The hazardous ingredients of a substance can usually be found in which general section of a MSDS?

   a. Control Measures
   b. Special Precautions
   c. Hazardous Ingredients
   d. Health Hazard Data

4. The Lower Explosive Limit and Upper Explosive Limit can usually be found in which general section of a MSDS?

   a. Fire and Explosion Hazard Data
   b. Reactivity Data
   c. Hazardous Ingredients
   d. Physical/Chemical Data

5. The steps to take if the chemical is released or spilled can usually be found in which general section of a MSDS?

   a. Control Measures
   b. Special Precautions
   c. Hazardous Ingredients
   d. Reactivity Data

6. The stability of a chemical can usually be found in which general section of a MSDS?

   a. Fire and Explosion Hazard Data
   b. Reactivity Data
   c. Hazardous Ingredients
   d. Physical/Chemical Data

7. The chemical name and any synonyms for a hazardous chemical can usually be found in which general section of a MSDS?

   a. Hazardous Ingredients
   b. Heading and Manufacturer's Data
   c. Health Hazard Data
   d. Reactivity Data

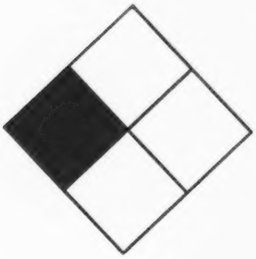
8. Any required personal protective equipment can usually be found in which general section of a MSDS?

   a. Control Measures
   b. Heading and Manufacturer's Data
   c. Health Hazard Data
   d. Special Precautions

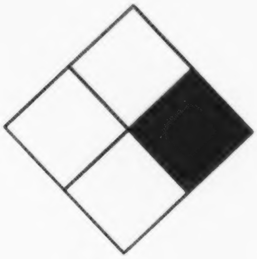
HAZARDOUS MATERIALS
SELF-TEST 4

1. Which hazard warning diamond below is marked to show the flammability hazard of a chemical?

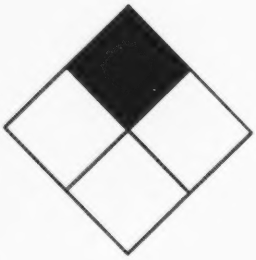
a.



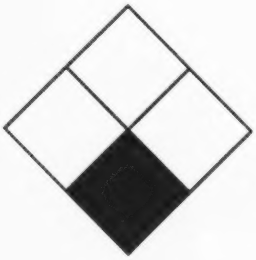
b.



c.

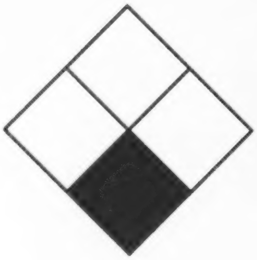


d.



2. Which hazard warning diamond below is marked to show the health hazard of a chemical?

a.



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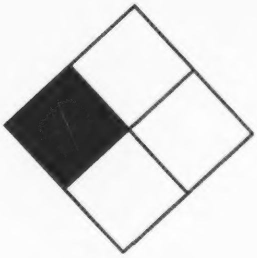
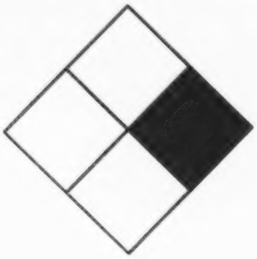
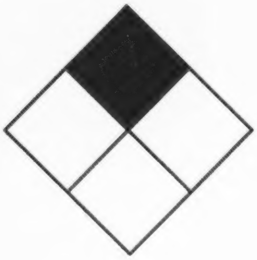


c.

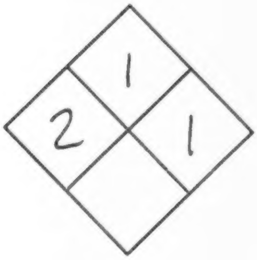


d.



3. Which chemical below has the greatest reactivity hazard?

a.



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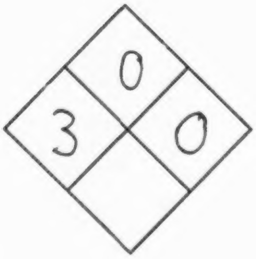
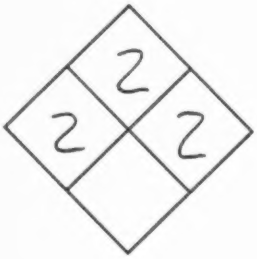
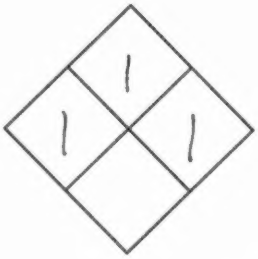


c.

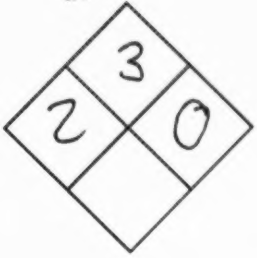


d.



4. Which chemical below has the greatest flammability hazard?

a.



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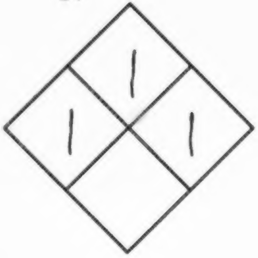
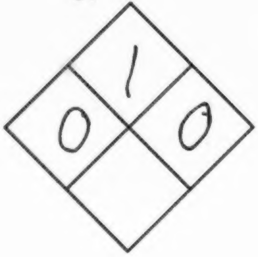
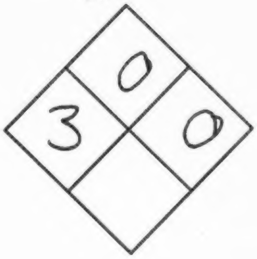


c.

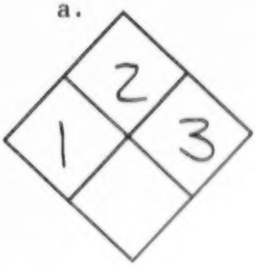


d.

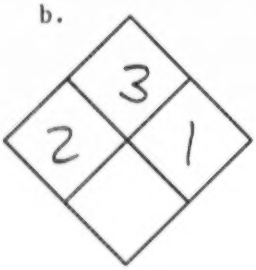


5. A chemical with a health hazard of 2, a flammability hazard of 3, and a reactivity hazard of 1, is shown by which warning system below?

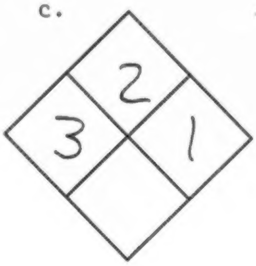
a.



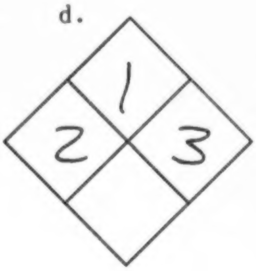
b.



c.



d.



HAZARDOUS MATERIALS
ANSWERS TO SELF-TESTS

NOTE: Check the appropriate pages in this unit for more information or explanations.

SELF-TEST 1

1. American Conference of Governmental Industrial Hygienists
2. International Agency for Research on Cancer
3. Permissible Exposure Limit
4. Threshold Limit Value
5. Material Safety Data Sheet
6. Code of Federal Regulations
7. Chemical Abstracts Service

SELF-TEST 2

1. b; 2. c; 3. Inhalation, Absorption, Ingestion; 4. c; 5. d (absorption from your hands, ingestion from the sweet roll, inhalation from the poor ventilation)

SELF-TEST 3

1. b; 2. d; 3. c; 4. a; 5. b; 6. b; 7. b; 8. a

SELF-TEST 4

1. c; 2. b; 3. c; 4. a; 5. b

8 8 8 8 8 8 8 8

Fire Prevention

Fire Prevention

Fire Prevention

Fire Prevention

Fire Prevention

Fire Prevention

Fire Prevention

Fire Prevention

Fire Prevention

INSTRUCTOR'S GUIDELINES

OBJECTIVE: The objective of this presentation is to instruct participants in basic methods of fire prevention. Discuss fire prevention as the safest way to control fire emergencies -- keep such emergencies from starting in the first place. The use of fire fighting equipment is not necessarily the appropriate first response to a fire emergency. Participants should know how to prevent fires, not just how to control them once they have started.

1. USE this unit as a source of supplemental safety training in fire prevention

2. ORDER or OBTAIN supplemental training materials for your presentation

   a. Films and videotape

      (1) Fire Safety: Extinguishers. Color, 15 minutes, 16 MM. Available for purchase as 16MM film or on VHS from AIMS Media, 6901 Woodley Avenue, Van Nuys, California 91406-4878, or toll-free at (800) 367-2467

      (2) Stop a Fire Before It Starts. Color, 10 minutes, Journal Films, Inc., 1975. Available from Journal Films, Inc., 930 Pitner Avenue, Evanston, Illinois 60202

      (3) Safety On the Job Series: Fire Extinguishers. Color, 23 minutes, VHS. Available from AIMS Media, 6901 Woodley Avenue, Van Nuys, CA 91406-4878, or toll-free at (800) 367-2467

   b. Written materials

      (1) Full-color transparencies from the unit "Fire Behavior" in the manual Essentials of Fire Fighting from International Fire Service Training Association (IFSTA)

      NOTE: This set of 17 transparencies covers the burning process, and includes a plastic universal mount and an interleaf of each transparency. Available from Fire Protection Publications, Oklahoma State University, Stillwater, Oklahoma 74078, or toll-free at (800) 654-4055

      (2) NFPA 10 -- Portable Fire Extinguishers

      (3) 29 CFR 1910 of the OSHA General Industry Safety and Health Standards -- Selected sections as needed

(4) Materials from the National Safety Council, fire insurance carriers, and others about the proper selection and distribution of portable fire extinguishers

(5) References available in Appendix C to Subpart L of the OSHA General Industry Safety and Health Standards

(6) Fire Protection Handbook (Current Edition), from the National Fire Protection Association (NFPA)

(7) Essentials of Fire Fighting (Current Edition), from the International Fire Service Training Association

NOTE: See 2(b) for ordering information.

(8) Accident Prevention Manual for Industrial Operations--Engineering and Technology (Current Edition), from the National Safety Council

For current catalog, write or call the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois 60611 or 1-800-621-7619; or contact the Oklahoma Safety Council, P.O. Box 14686, Oklahoma City, Oklahoma 73113 or (405) 848-8626

c. Chalkboard, flip chart, chalk, marking pens, etc.

3. SHOW samples of fire safety equipment

   a. Types of fire extinguishers in use
   b. Maps showing locations of fire extinguishers, fire doors, fire exits
   c. Other equipment

4. PHOTOGRAPH any violations of safety rules for fire prevention that you find at your job site

   HINT: Use your on-site photographs when you discuss the appropriate topics.

INSTRUCTOR'S GUIDELINES

Glossary

1. DISCUSS the fire safety terms and definitions

   NOTE: Refer to NFPA definitions, if possible.

2. ASK for examples that illustrate each definition

FIRE PREVENTION

GLOSSARY

1. Combustible -- Able to burst into flames.

2. Combustion* -- An exothermic (heat-producing), self-sustaining reaction involving a solid, liquid, and/or gas-phase fuel. Usually associated with the oxidation of a fuel by atmospheric oxygen with the emission of light.

   NOTE: Oxygen in the air is the most common oxidizing agent. However, combustion may also occur in special cases in an atmosphere of chlorine, carbon dioxide, nitrogen, and some other gases without oxygen being involved. For example, zirconium dust can be ignited in carbon dioxide.

3. Conduction -- The transfer of heat from one place to another by direct contact with a burning or heated object or by contact with a heat-carrying object that connects one material with a burning or heated material.

4. Convection -- The transfer of heat through moving air or liquid.

5. Flammable -- Able to be easily ignited and burn very quickly.

6. Molten -- A metal changed to a liquid by heating it above its melting point.

7. Organic -- A natural or nonchemical substance; a substance that contains the element carbon.

8. Radiation -- The transfer of heat through waves: "radiant heat" means a wave of heat, like the heat waves that are given off by a hot object such as hot metal, glowing coals, etc.

9. Toxicity* -- The ability of a material to cause bodily harm by chemical action. In common usage, the term "toxic substance" describes a substance that can pass through a body surface, i.e., eyes, skin, lungs, or the digestive tract, and enter the bloodstream. Toxicity is the measure of the injury produced under test conditions. It can affect organs remote from the point of contact.

10. Vapor -- A solid or a liquid that is in the form of a gas; a substance that is suspended or floating in air, such as water vapor (fog).

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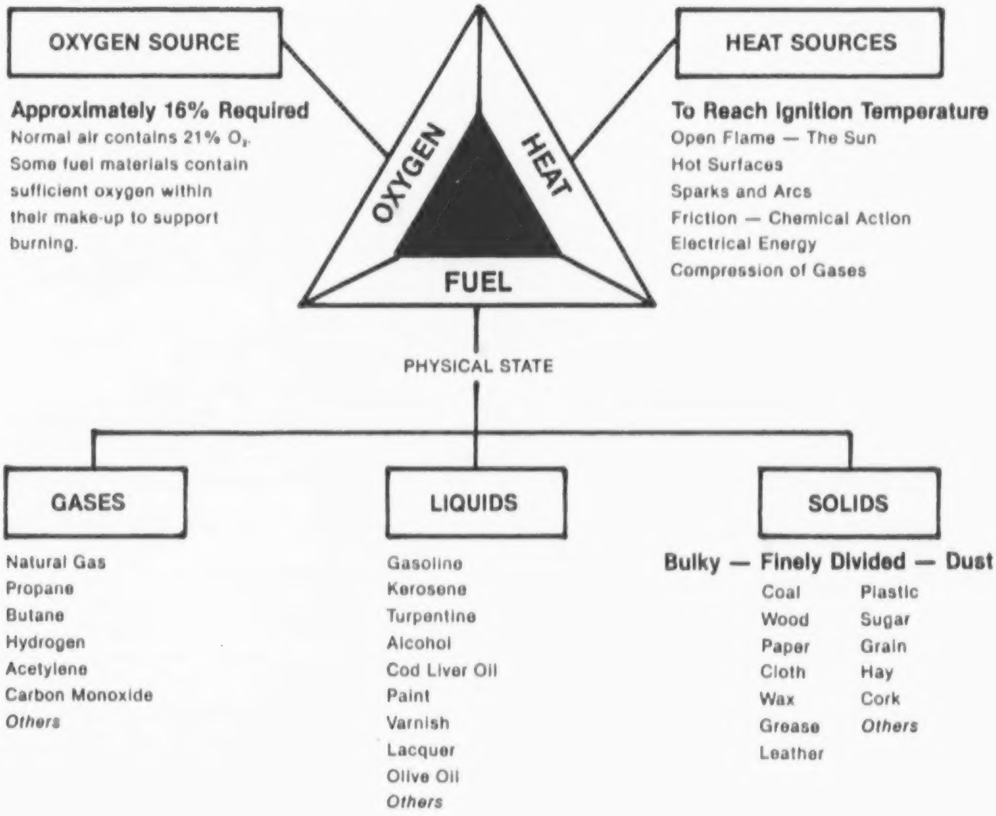
INSTRUCTOR'S GUIDELINES

Elements Needed for a Fire

1. EXPLAIN the parts of the fire triangle
2. EXPLAIN the relationship between the three parts of the fire triangle

FIRE PREVENTION

ELEMENTS NEEDED FOR A FIRE



OXYGEN SOURCE

Approximately 16% Required
Normal air contains 21% O_2.
Some fuel materials contain
sufficient oxygen within
their make-up to support
burning.

HEAT SOURCES

To Reach Ignition Temperature
Open Flame — The Sun
Hot Surfaces
Sparks and Arcs
Friction — Chemical Action
Electrical Energy
Compression of Gases

GASES

Natural Gas
Propane
Butane
Hydrogen
Acetylene
Carbon Monoxide
Others

LIQUIDS

Gasoline
Kerosene
Turpentine
Alcohol
Cod Liver Oil
Paint
Varnish
Lacquer
Olive Oil
Others

SOLIDS

Bulky — Finely Divided — Dust
Coal
Wood
Paper
Cloth
Wax
Grease
Leather
Plastic
Sugar
Grain
Hay
Cork
Others

NOTE: A fire cannot exist if sources of fuel, heat, or oxygen are removed. All three elements must be present, and a chemical chain reaction must take place, for flaming combustion to continue.

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INSTRUCTOR'S GUIDELINES

Dangers from Burning

1. DISCUSS each possible danger and the reasons for the danger (Reasons are given after each item)

2. DESCRIBE how smoke can cause paralyzing fear, and explain the possible consequences

3. QUESTION your participants about the possible dangers from a fire at their job site and in specific work areas:

    a. What sources of heat, fuel, and oxygen are present at your job site? In which work areas?

    NOTE: List examples of fuel sources that are gases, liquids, or solids.

    b. How could these parts of the fire triangle combine during daily operations and processes to create a fire danger or fire emergency?

    c. Air is not the only source of oxygen for a fire. What sources of fuel at your job site could contain oxygen which could fuel a fire?

    d. Can you identify any possible fire gases that could be present at your job site or in any work area in a fire emergency? Are you using any materials in operations or processes which have thermal decomposition products?

    HINT: This information should be available from the Material Safety Data Sheet for the substance.

FIRE PREVENTION

DANGERS FROM BURNING*

Fire Gases -- Fire gases are the vaporized products of combustion, or burning. For example, carbon when burned forms carbon dioxide and carbon monoxide vapors.

DANGERS: Hydrogen sulfide is another fire gas that may be formed in fires involving organic material containing sulfur, such as hair, wool, meat, and hides. It is a colorless gas and is highly toxic. Fire gases (and smoke) are common causes of death in fires, and can also damage the lungs.

Flames -- The visible part of a burning gas that becomes hotter and less bright when mixed with increasing amounts of oxygen.

DANGERS: Flames (and heat)damage not only property, but also cause painful injuries and often permanent scarring of the person burned.

Heat -- A type of energy measured in degrees of temperature. Heat is responsible for the spread of fire.

DANGERS: Heat is the direct cause of burns, and heat-related injuries include heat exhaustion, dehydration (loss of body fluids), and damage to your respiratory tract.

Smoke -- A visible result of incomplete burning. Smoke is usually made up of oxygen, nitrogen, carbon dioxide, some carbon monoxide, fine particles of soot and carbon, and products of the burning material.

DANGERS: Smoke is dangerous because (1) it reduces your visibility in a fire emergency, which can in turn trap you in a smoke-filled building, and (2) it can damage your lungs or kill you if you breathe enough of it.

Thermal decomposition products -- Other gases and materials that result when a substance burns or is heated beyond a certain temperature. The "new" gases given off or the materials formed can be dangerous in a fire emergency.

EXAMPLES: Perchloroethylene decomposes at a high temperature to form phosgene and hydrogen chloride. Phosgene is highly toxic, and hydrogen chloride is corrosive.

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INSTRUCTOR'S GUIDELINES

Fire Safety Questions for Your Work Areas

HINT: Invite a representative from the local fire department -- someone who is familiar with your job site -- to help answer questions about the fire hazards that exist in different work areas at your job site.

1. READ the fire safety questions

2. EXPLAIN that the list is not complete -- ASK for examples of other considerations in addition to those listed

3. HAVE participants evaluate the fire hazards that exist in their work areas. Ask different participants to name a work area and the hazards that exist in that area. Make a list of their responses

   NOTE: State that participants should consider the list of fire safety questions when they evaluate the fire hazards that exist in any work area.

FIRE SAFETY QUESTIONS FOR YOUR WORK AREAS*

NOTE: This list is not complete.

What materials are flammable?

What materials are likely to burn, ignite, or explode?

Where are possible sources of ignition such as sparks, open flames, or high temperatures?

Where are flammable and combustible materials located?

How are flammable and combustible materials stored? (If one should burn, could others ignite easily?)

Can any materials present ignite due to convection or radiation of heat?

What toxic gases could be formed in a fire in each work area?

Can a fire spread to other work areas? How long would it take?

Do you know how to use the fire extinguishers in your work area?

Do you know how to sound a fire alarm?

Does your facility or work area have designated smoking areas?

Are ducts, sprinkler heads, exhaust vents, and smoke detectors clean of dust, paint, and other blockage?

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*Adapted with permission from Accident Prevention Manual for Industrial Operations -- Engineering and Technology (9th Edition), National Safety Council, 444 North Michigan Avenue, Chicago, Illinois 60611. Copyright 1988.

INSTRUCTOR'S GUIDELINES

Common Causes of Industrial Fires

1. REVIEW the common causes of industrial fires and the reasons for each, and the preventive steps to take

2. DISCUSS the causes that relate to a participant's job site or work area

   EXAMPLE: Could hot surfaces cause a fire at your facility? Could cutting and welding cause a fire at your facility?

3. ASK for examples of other preventive steps for each cause of fire, in addition to those listed

4. DESCRIBE your company's policy for preventing fires at the job site and in specific work areas

FIRE PREVENTION

COMMON CAUSES OF INDUSTRIAL FIRES*

NOTE: This list is not complete.

Cause	Reasons	Prevention
Electricity	Electrical defects from poor maintenance in wiring, motors, switches, heating elements, etc. Improper equipment in areas with flammable vapors, gases, dusts Temporary wiring	Proper design and installation Adequate maintenance
Incendiarism	Storage areas with few employees, especially vulnerable Disgruntled employees, trespassers	Adequate security: fencing, lighting, locked doors and windows, alarms, guards Control of visitor and employee traffic
Smoking	Violations of smoking rules -- Smoking near flammable liquids, combustible materials Smoking outside smoking areas	Education and enforcement of rules and guidelines Provide safe receptacles
Friction	Hot bearings Misaligned or damaged machine parts Choking or jamming material Poorly adjusted moving parts	Regular schedule of inspection, maintenance, and lubrication
Hot Surfaces	Combustibles exposed to hot ducts or flues, heating elements, electric lamps, hot or molten metals, furnaces, etc.	Safe design and good maintenance of piping systems for flammable liquids Safe clearances, proper insulation, and air circulation between hot surfaces and combustibles

FIRE PREVENTION

COMMON CAUSES OF INDUSTRIAL FIRES

Cause	Reasons	Prevention
Hot Surfaces		Maintenance of refractory linings of molten metal or glass furnaces
Overheating	Overheating flammable liquids Abnormal process temperatures Materials in dryers, etc	Close supervision Qualified operators Temperature controls (for monitoring and automatic shutdown)
Open Flame	Gas or oil burners, torches, and other sources near combustible materials, flammable liquids, or other fire hazards	Proper design, operation, and maintenance of fuel-burning equipment Proper ventilation Isolation of combustibles from flame sources
Mechanical Sparks	Foreign materials in stock, such as nails in wood, which cause sparks in tools and machines Oil pans used near cutting machines (oil pan as a foreign material in work area) Loose machinery parts	Keeping stock clean Removing spark-causing material from stock or from machines Maintain machinery
Combustion Sparks	Sparks from burning trash, furnaces, foundry cupolas, fireboxes, lift trucks, and other sources	Use of well-designed equipment Use of well-enclosed combustion chambers with spark arresters, as needed

FIRE PREVENTION

COMMON CAUSES OF INDUSTRIAL FIRES

Cause	Reasons	Prevention
Combustion Sparks		Avoid gasoline or diesel lift trucks in areas normally having combustible dusts, gases, and liquids
Cutting and Welding	Cutting and welding where sparks, arcs, and hot metal could ignite combustible materials	Use of permits for operating equipment Cover or relocate exposed combustibles Inspect area after work stops
Spontaneous Ignition	In oily waste and trash, dryers, ducts, industrial wastes, and materials that undergo self-oxidation and give off heat	Good housekeeping Regular waste removal, cleaning of ducts and other areas
Chemical Action	Out-of-control process, decomposition of unstable chemical, accidental contact between chemicals	Knowledge of hazard characteristics Design, operation, and maintenance of process equipment

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INSTRUCTOR'S GUIDELINES

Emergency Action Plan

1. REFER to 29 CFR 1910.38 for each numbered item -- provide copies of the appropriate sections, if possible

2. EXPLAIN the exceptions to the written plan, stated in 29 CFR 1910.38 (a)(5)(iii)

3. READ through the list of components in the Emergency Action Plan

   NOTE: These are the minimum required topics for the plan.

4. QUESTION your participants about the Emergency Action Plan:

   HINT: Ask different participants to answer these and other questions, and write down their responses. Your goal is to determine how well your employees understand your company's Emergency Action Plan.

   a. What kinds of "critical plant operations," if any, exist at your job site? What procedures are in place for any employees involved with those operations?
   b. How do you account for all employees after an evacuation?
   c. How do you report fires and other emergencies at your facility?

5. EXPLAIN or REVIEW the Emergency Action Plan in place at your facility, and DESCRIBE the role of employees in the Plan

FIRE PREVENTION

EMERGENCY ACTION PLAN

The Emergency Action Plan must be a written plan* and must include at least

1. Emergency escape procedures and escape route assignments
2. Procedures for employees who stay behind to continue critical plant operations before they must evacuate
3. Procedures to account for all employees after the evacuation is completed
4. Rescue and medical duties for employees who will perform those duties
5. Preferred means of reporting fires and other emergencies
6. Names or regular job titles of persons or departments who can be contacted for (1) more information or (2) an explanation of duties under the plan
7. An established employee alarm system

   REFERENCE: 29 CFR 1910.165

8. Types of evacuation to be used in emergency circumstances
9. Training -- before the plan is implemented -- of enough designated persons to help with a safe and orderly evacuation

   REFERENCE: 29 CFR 1910.38 (a)(5)

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*Except as provided for in 29 CFR 1910.38 (a)(5)(iii).

INSTRUCTOR'S GUIDELINES

Fire Prevention Plan

1. REFER to 29 CFR 1910.38 (b) for each numbered item -- provide copies of the appropriate sections, if possible

2. EXPLAIN the exceptions to the written plan, stated in 29 CFR 1910.38 (b)(4)(ii)

3. READ through the list of components in the Fire Prevention Plan

   NOTE: These are the minimum required topics for the plan.

4. REFER back to the "Fire Safety Questions for Your Work Areas" as a resource when identifying major fire hazards in the workplace, potential sources of ignition, and preventive steps. Also refer again to Common Causes of Industrial Fires

5. QUESTION your participants about the Fire Prevention Plan:

   HINT: Ask different participants to answer these and other questions, and write down their responses. Your goal is to determine how well your employees understand your company's fire prevention plan.

   a. Do you have a Fire Prevention Plan? Describe your existing plan.
   b. Does your existing plan cover the minimum required topics?

6. EXPLAIN or REVIEW the Fire Prevention Plan in place at your facility, and DESCRIBE the role of employees in the Plan

FIRE PREVENTION PLAN

The Fire Prevention Plan must be a written plan* and must include at least

1. A list of (1) major fire hazards in the workplace, (2) their proper handling and storage procedures, (3) potential sources of ignition and their control procedures, and (4) the type of fire protection equipment or systems needed to control a fire involving the fire hazards
2. Names or regular job titles of personnel responsible for maintaining equipment and the systems installed to prevent or control ignitions of fires
3. Names or regular job titles of personnel responsible for controlling fuel source hazards
4. Housekeeping procedures for preventing flammable and combustible waste materials and residues from accumulating
5. Training for employees about the fire hazards of the materials and processes to which they are exposed

   NOTE: Employers must review those parts of the fire prevention plan which the employee must know to protect the employee in the event of an emergency.

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*Except as provided for in 29 CFR 1910.38 (b)(4)(ii).

INSTRUCTOR'S GUIDELINES

Employee Alarm System

1. REFER to 29 CFR 1910.165 for each numbered item -- provide copies of the appropriate sections, if possible

2. EXPLAIN the scope and application of the requirements, stated in 29 CFR 1910.165 (a)

3. READ through the list of requirements

4. QUESTION your participants about the Employee Alarm System:

   HINT: Ask different participants to answer these and other questions, and write down their responses. Your goal is to determine how well your employees understand your company's Employee Alarm System.

   a. What kind of employee alarm system works best at your job site? Describe your existing system.
   b. Does your existing alarm system vary for different work areas, such as areas where operations or processes involve high levels of noise or light?
   c. What kind of signal(s) can you use which are distinctive and recognizable?

5. EXPLAIN or REVIEW the Employee Alarm System in place at your facility, and DESCRIBE the role of employees in the System

FIRE PREVENTION

EMPLOYEE ALARM SYSTEM

NOTE: For exceptions to these rules, see 29 CFR 1910.165 (a)(1-3).

Requirements of the System

1. Provide warning for needed emergency action as called for in the emergency action plan, or

   Provide warning for reaction time for the safe escape of employees from the workplace or the immediate work area, or both

2. Be recognized above levels of ambient noise or light by all employees in the affected areas

3. Be distinctive and recognizable as a signal to evacuate the work area or to act according to the emergency action plan

Other Requirements

1. Employers must explain to each employee the preferred means of reporting emergencies

   EXAMPLES: Manual pull-box alarms, public address systems, radio or telephone alarm systems, etc.

2. Employers must post emergency telephone numbers near telephones, or employee notice boards, and other conspicuous places when telephones are a means of reporting emergencies

   NOTE: Where a communication system also serves as the employee alarm system, all emergency messages must have priority over all non-emergency messages.

3. Employers must establish procedures for sounding emergency alarms in the workplace

   NOTE: For exceptions to this rule, see 29 CFR 1910.165(b)(5).

INSTRUCTOR'S GUIDELINES

Methods of Extinguishing Fires

1. REVIEW the methods
2. RELATE each method to the appropriate part of the fire triangle--each method of extinguishing a fire "proves" the relationship that exists between the parts of the fire triangle

METHODS OF EXTINGUISHING FIRES*

1. Reducing the temperature -- Cooling the fuel to the point where it does not produce enough vapors to burn or keep a flammable vapor. Heat is carried from the fire by radiation, conduction, convection, or absorption by a cooling agent (such as water).

   NOTE: Water absorbs more heat per volume than any other cooling agent.

2. Removing the fuel -- Removing the gases, liquids, or solids that are "feeding" the fire.

   EXAMPLES: Turning off a fuel supply, transfering flammable liquids from a burning tank, removing unburned parts of solid fuel sources, weakening liquid fuels or flammable gases, clearing the path of a fire, etc.

3. Reducing the oxygen -- Reducing the amount of oxygen in the fire area, separating the oxygen from the fuel (such as by "smothering" or "blanketing"), or another method.

   NOTE: This method of extinguishing the fire does not work on self-oxidizing materials (materials that produce oxygen) or on certain metals that will produce oxygen with carbon dioxide or nitrogen--two common extinguishing agents.

4. Breaking the chain reaction -- Breaking up the reactions that happen during the burning process. Some extinguishing agents interrupt the flame-producing chemical reaction, putting the fire out.

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INSTRUCTOR'S GUIDELINES

Classes of Fires -- Definitions

1. DEFINE the classes of fires and give examples of each class
2. EXPLAIN that each class of fire is represented by a letter or a diagram on fire extinguishers

FIRE PREVENTION

CLASSES OF FIRES

Definitions

CLASS A	Ordinary combustibles such as wood, paper, cloth
CLASS B	Flammable liquids, such as gasoline, oils, paints, and grease
CLASS C	Live electrical equipment, such as motors, switches, and computers
CLASS D	Combustible metals, such as zinc, magnesium, sodium, titanium, potassium, lithium, calcium, and zirconium

NOTE: Portable fire extinguishers for Class D hazards are required in combustible metal working areas where combustible metal powders, flakes, shavings, or similarly-sized products are generated at least once every two (2) weeks.

INSTRUCTOR'S GUIDELINES

Classes of Fires -- Fire Prevention Steps

1. DISCUSS the Fire Prevention Steps for each class of fire
2. EXPLAIN the importance of each step in preventing that class of fire from starting

FIRE PREVENTION

CLASSES OF FIRES

Fire Prevention Steps

NOTE: Follow all OSHA guidelines.

Class A Fires

1. THROW AWAY combustible wastes and trash correctly for the operations and processes that create the wastes

   NOTE: Follow all federal, state, and local laws for disposing of wastes and trash.

2. INSPECT waste storage areas regularly
3. KEEP work areas clean

   NOTE: Create and follow housekeeping methods that help prevent waste and trash from piling up.

4. KEEP outside areas clear of trash, brush, or tall grass
5. USE "special" materials carefully (See chart below)

Material	**Safety Steps**
Dusts	Collect dust with local exhaust systems
	Clean ceilings, walls, and structural members
	Remove or control dusts around all sources of ignition
Plastics	Keep plastics away from all sources of ignition
Combustible Waste Materials	Store combustible waste materials, like oily rags, painting rags, etc., in approved covered metal containers
	Throw away combustible waste materials every day
Combustible Cleaning Materials	Store oily mops, etc., in approved covered metal containers
	Use cleaning materials carefully, especially when near sources of ignition

FIRE PREVENTION

CLASSES OF FIRES

Fire Prevention Steps

NOTE: Follow all OSHA guidelines.

Class B Fires

1. AVOID using highly flammable liquids if possible
2. STORE flammable liquids in approved fire-resistant containers

   CAUTION: KEEP ALL FLAMMABLE LIQUIDS IN CLOSED CONTAINERS WHEN NOT BEING USED. NEVER STORE FLAMMABLE LIQUIDS IN GLASS CONTAINERS.

3. USE only the amount of flammable liquids that you need for the job -- Do not keep extra amounts of flammable liquids at any work area
4. STORE large amounts of flammable liquids in a separate fire-resistant building or storage area

   NOTE: Follow all OSHA guidelines.

5. USE proper ventilation and exhaust systems for operations and processes that involve flammable liquids, including storage
6. REMOVE or CONTROL all causes of industrial fires
7. KEEP adequate clearances between flammable liquids and any sources of heat
8. CLEAN all spills of flammable liquids immediately
9. CHECK that connections on drums containing flammable liquids are vapor tight and heat tight

FIRE PREVENTION

CLASSES OF FIRES

Fire Prevention Steps

NOTE: Follow all OSHA guidelines.

Class C Fires

1. MAINTAIN all cords, motors, switches, heating elements, and other electrical equipment in safe working order

2. KEEP all tools and power cords away from heat, oil, and sharp edges

   NOTE: Sharp edges can damage electrical insulation.

3. TURN OFF electrical equipment before disconnecting the power cord

   NOTE: Hold the plug when disconnecting the cord. Do not pull on the cord!

4. CHECK that electrical equipment is properly grounded

   NOTE: Do not use remove the third prong on a three-prong grounded plug. Always use a three-prong plug with a three-prong socket.

5. DO NOT WRAP any cloth around a tool that is too hot to handle--Sparks could ignite the cloth

6. DO NOT OVERLOAD circuits

7. AVOID using extension cords

   NOTE: If you must use an extension cord, choose a cord that has the same ampere rating as the tool.

FIRE PREVENTION

CLASSES OF FIRES

Fire Prevention Steps

NOTE: Follow all OSHA guidelines.

Class D Fires

1. COLLECT combustible metal powders, flakes, chips, and shavings regularly
2. KEEP oil or grease away from combustible metal powders, flakes, chips, and shavings
3. GATHER particles of combustible metals in clearly labeled, covered, clean dry steel containers for salvage
4. STORE combustible metals in approved isolated storage areas or away from all buildings

INSTRUCTOR'S GUIDELINES

Symbols for Fire Extinguishers

1. EXPLAIN the letter symbols and picture symbols

   HINT: Photograph the equipment and symbols used at your job site.

2. PROVIDE samples of different types of fire extinguishers and point out the symbols on each

   NOTE: Each participant's job site should have fire extinguishers for each type of fire that could occur.

3. DISCUSS the possible combinations of symbols used on fire extinguishers

   NOTE: Also explain the meaning of a "slash" through a symbol.

4. CREATE scenarios of different fire emergencies involving different classes of fire, and ask participants to:

   a. Identify the class of fire present

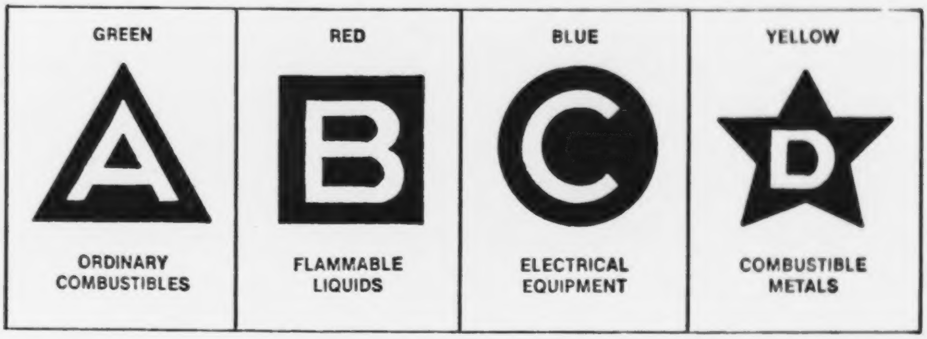
   b. Identify the type(s) of fire extinguisher needed

      HINT: Use the chart of "Common Causes of Industrial Fires" for creating sample fire emergencies, if needed. The fire emergencies should apply to your job site and the hazards present in operations and processes at your job site.

FIRE PREVENTION

SYMBOLS FOR FIRE EXTINGUISHERS

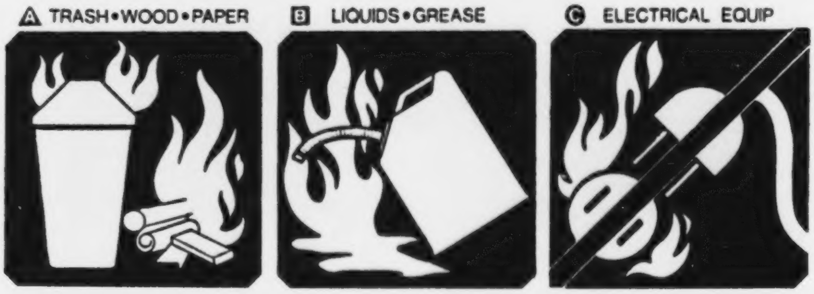
NOTE: Letters, shapes, and colors show the classes of fires on which a labeled extinguisher can be used.


GREEN
A
ORDINARY COMBUSTIBLES
RED
B
FLAMMABLE LIQUIDS
BLUE
C
ELECTRICAL EQUIPMENT
YELLOW
D
COMBUSTIBLE METALS

FIRE PREVENTION

SYMBOLS FOR FIRE EXTINGUISHERS

NOTE: A blue background shows the classes of fires on which a labeled extinguisher can be used. A red line across a black background shows the classes of fires on which a labeled extinguisher cannot be used.



In the above example, the extinguisher can be used on a Class A or Class B fire. It cannot be used on a Class C fire.

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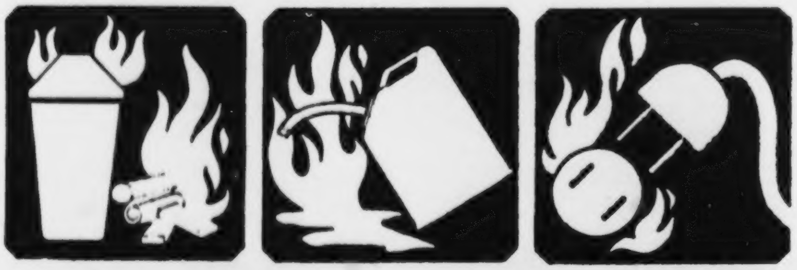
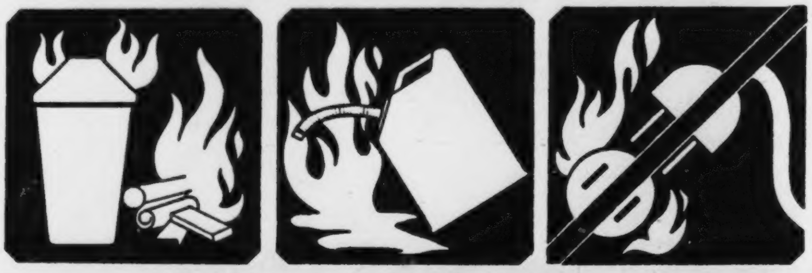
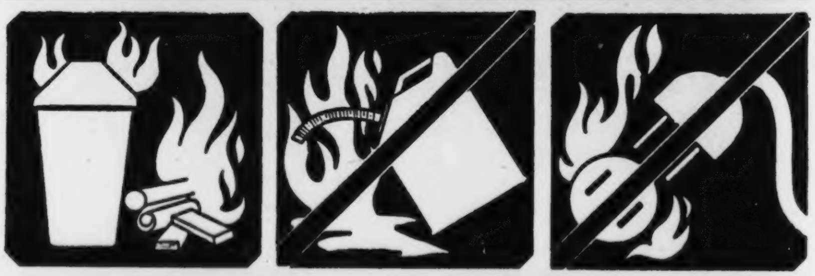
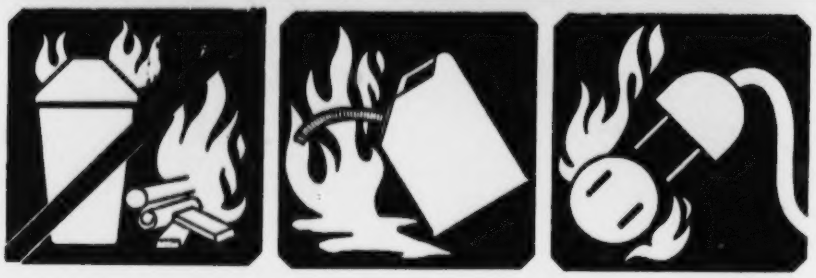
FIRE PREVENTION

SYMBOLS FOR FIRE EXTINGUISHERS

Examples of Extinguisher Labels

Extinguisher Label	Class of Fire
	A, B, C
	A, B
	A
	B, C

INSTRUCTOR'S GUIDELINES

Types of Fire Extinguishers

1. REVIEW the chart showing the different types of fire extinguishers and their proper (and safe) uses

   NOTE: Explain that using a fire extinguisher is not the safest response to a fire emergency if the extinguisher is not appropriate for the class of fire present.

2. DISCUSS the basic use of portable fire extinguishers. Refer to 29 CFR 1910.157 (a-g)

3. QUESTION your participants about the location and use of fire extinguishers:

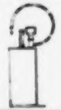
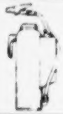
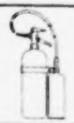
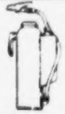
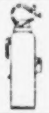
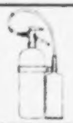
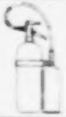
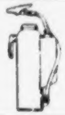
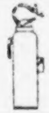
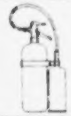
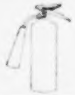
   a. Can you identify the location of fire extinguishers at your job site or near any specific work areas?
   b. Are the extinguishers at your job site easy to find?
   c. Are extinguishers located according to the travel distances given by OSHA?

4. EXPLAIN the stages of fire, if needed, to define the "incipient stage"

   NOTE: Definitions are available in Essentials of Fire Fighting (2nd Edition) and in Accident Prevention Manual for Industrial Operations -- Engineering and Technology (9th Edition).

FIRE PREVENTION

TYPES OF FIRE EXTINGUISHERS*

KIND OF FIRE		APPROVED TYPE OF EXTINGUISHER					
DECIDE THE CLASS OF FIRE YOU ARE FIGHTING. . .	THEN CHECK THE COLUMNS TO THE RIGHT OF THAT CLASS	MATCH UP PROPER EXTINGUISHER WITH CLASS OF FIRE SHOWN AT LEFT Important: Using the wrong type extinguisher for the fire may be dangerous					
		CARBON DIOXIDE Carbon Dioxide Gas Under Pressure	**PUMP TANK** Plain Water	**MULTI-PURPOSE DRY CHEMICAL**	**ORDINARY DRY CHEMICAL**	**HALON**	**DRY POWDER**
A **CLASS A FIRES** Use These Extinguishers ORDINARY COMBUSTIBLES ●Wood ●Paper ●Cloth, etc.							
B **CLASS B FIRES** Use These Extinguishers FLAMMABLE LIQUIDS, GREASE ●Gasoline ●Paints ●Oils, etc.							
C **CLASS C FIRES** Use These Extinguishers ELECTRICAL EQUIPMENT ●Motors ●Switches, etc.							
D **CLASS D FIRES** Use This Extinguisher COMBUSTIBLE METALS ●Iron ●Magnesium							

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INSTRUCTOR'S GUIDELINES

Basic Use of Fire Extinguishers

HINT: Invite a representative from your local fire department to demonstrate the correct use of fire extinguishers and to conduct an outdoor demonstration.

1. DEMONSTRATE each of the steps

2. ASK your participants what could happen when an employee knows how to operate an extinguisher, but does not know how to choose the proper type of extinguisher for a specific fire situation

   HINT: This question can lead into the videotape.

3. CONDUCT an outdoor demonstration with the local fire department, for practice in using extinguishers

FIRE PREVENTION

BASIC USE OF FIRE EXTINGUISHERS*

NOTE: Always follow the operating instructions found on the label of each extinguisher at your facility. The basic steps for using an extinguisher are similar but are not the same. You should become familiar with the proper use of each type of extinguisher that you may have to use in an emergency.

1. P -- PULL the pin at the top of the extinguisher that keeps the handle from being pressed. Break the plastic or thin wire inspection band.

   NOTE: Carry and operate the extinguisher in its upright position. Only obsolete soda-acid, foam, and cartridge operated water extinguishers are designed to be turned upside down.

2. P -- POINT the nozzle or outlet toward the fire.

   NOTE: Some hose assemblies are clipped to the body of the extinguisher. Release the hose assembly, then point.

3. P -- PRESS the handle above the carrying handle to discharge the contents inside.

   NOTE: You can release the handle to stop the discharge at any time.

4. S -- SWEEP the nozzle back and forth at the base of the flames to spread the extinguishing agent.

   NOTE: After the fire is out, look for smoldering hot spots or reflash of flammable liquids. Be sure the fire is out.

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INSTRUCTOR'S GUIDELINES

Employee Responses to Fires

1. DISCUSS the suggestions for responding to a fire emergency

2. ASK participants for examples of the policies followed at their facility regarding employee response to fires

   HINT: This question can tell you how well your employees understand their role in fire prevention at your company, as well as tell you how much review training may be needed on the topic of employee responses to fires.

3. HAVE participants explain their response to fire emergency scenarios that you describe

   HINT: You could encourage other participants to evaluate and discuss each response. The fire emergencies should apply to your job site and to specific work areas. Use a different work area for each sample fire emergency.

FIRE PREVENTION

EMPLOYEE RESPONSES TO FIRES*

NOTE: The following responses are suggestions only. They are not the recommended responses to any specific fire emergency. Always follow the procedures outlined in the Emergency Action Plan for your job site.

Fight the Fire
(If all of these conditions are met)

1. If a clear exit is available,

2. If the fire brigade or fire department was called or is being called,

   NOTE: Appendix A to Subpart L of the Occupational Safety and Health Standards, Part 1910, covers the requirements for fire brigades.

3. If the fire is small,

4. If you know how to use the proper fire extinguisher, and

5. If the proper fire extinguisher is in working order.

Do Not Fight the Fire
(If any of these conditions are met)

1. If the fire is clearly spreading beyond its starting point, or

2. If the fire could block an exit, or

3. If you do not know how to use the proper fire extinguisher.

   CAUTION: USING THE WRONG TYPE OF FIRE EXTINGUISHER CAN CREATE A MORE DANGEROUS SITUATION.

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INSTRUCTOR'S GUIDELINES

Housekeeping

1. DISCUSS each of the housekeeping guidelines listed

   NOTE: All possible guidelines are not listed here.

2. ASK participants for examples of work areas at their job sites, then discuss possible housekeeping guidelines for those work areas in addition to those listed

   HINT: Explain the housekeeping guidelines followed at your job site for each work area.

3. GIVE examples of combustible wastes and trash that should be collected every day, especially examples of oil-soaked wastes and trash

4. DESCRIBE the type and location of the approved containers for combustible wastes and trash at your job site

   HINT: A representative from the local fire department may be able to suggest types of containers for different work areas and different wastes, if you do not already use such containers at your job site.

5. ASK participants why the guideline for flammable liquids (#5) is important in preventing a fire

6. EXPLAIN how housekeeping for fire safety requires more than "clean-up rules" -- equipment must also be correctly located and inspected regularly (Rule #6)

7. PRESENT examples of federal, state, and local laws in your area that regulate waste and/or trash disposal

FIRE PREVENTION

HOUSEKEEPING

NOTE: Follow all OSHA guidelines.

1. FOLLOW a schedule for collecting all combustible wastes and trash

   NOTE: Follow your housekeeping rules for fire prevention every day.

2. COLLECT all combustible wastes and trash from all work areas every day

   NOTE: Use only the approved containers for combustible wastes and trash, such as noncombustible containers with self-closing lids.

3. CLEAN all ventilation ducts

   NOTE: Combustible materials are more dangerous when they are in the air than after they have settled on floors and other surfaces.

4. CLEAN all beams, overhead pipes, machines and other surfaces where dust or other combustible material can collect

5. KEEP only the minimum amount of flammable liquids needed for the job in any work area

   CAUTION: STORE FLAMMABLE LIQUIDS IN APPROVED SAFETY CONTAINERS ONLY. NEVER STORE FLAMMABLE LIQUIDS IN GLASS CONTAINERS.

6. CHECK the locations of all fire fighting equipment, extinguishers, fire exit signs, alarms, and fire doors

   NOTE: Fire fighting equipment should be located according to OSHA guidelines, and fire doors must be clear at all times.

7. FOLLOW all federal, state, and local laws about disposing of wastes and trash

   HINT: Follow your company's disposal policy.

INSTRUCTOR'S GUIDELINES

Inspection Guidelines

HINT: Have your job site inspected by qualified fire department personnel as a way to identify the fire hazards at your workplace and the possible ways to limit those hazards in each work area. Use this information when you discuss this section.

1. EXPLAIN how this incomplete list of inspection guidelines "ties-in" the other areas of fire safety

2. DISCUSS each guideline and ask for examples of other guidelines that could be included

   HINT: Include other inspection guidelines in place at your job site.

3. EMPHASIZE the value of participants conducting their own inspections as a way of preventing fire emergencies at their work areas every day

   NOTE: If participants find weaknesses with their own ways of preventing fire emergencies, they can correct those weaknesses in time.

4. ASK participants to identify any weaknesses that they now recognize in their work area inspections, and suggest ways to correct those weaknesses

   HINT: Invite a representative from the local fire department to answer questions from participants about inspecting work areas for fire hazards on a daily basis.

FIRE PREVENTION

INSPECTION GUIDELINES

IMPORTANT: Use this list as a guide for inspecting your work area every day. This list is not complete and is not a substitute for a complete inspection by fire department personnel. Adapt these guidelines to the needs of your job site and specific work areas.

1. USE a written list of items for inspection

   NOTE: Be sure that your list is complete.

2. FOLLOW a regular schedule of inspections

   NOTE: You should inspect your work area for possible fire hazards every day.

3. FOLLOW all housekeeping steps for your work area

   HINT: Good housekeeping can reduce fire hazards and help keep your work area safe.

4. CHECK for common causes of industrial fires

   HINT: You can probably find these causes and correct help prevent them when you follow your housekeeping steps every day.

5. FOLLOW the fire prevention steps for each class of fire possible in your work area

   HINT: These steps can be part of your housekeeping steps for your work area every day.

6. CHECK for proper location and operation of fire fighting equipment, such as

   a. Fire extinguishers
   b. Fire doors and exits
   c. Smoke detectors
   d. Alarm systems
   e. Sprinkler heads and water supplies
   f. Emergency and medical supplies
   g. Shut-off valves, switches, etc.

   NOTE: Be sure that fire equipment has not been removed, moved from its proper location, blocked, etc., during the day. Your housekeeping steps could include a daily check of all fire fighting equipment in your work area.

FIRE PREVENTION
SELF-TEST 1

1. Gases, liquids, and solids are all examples of

   a. Oxygen
   b. Fuel
   c. Heat
   d. Combustion

2. In addition to a chemical chain reaction, what three (3) elements are needed for a fire to continue?

   a. Oxygen
   b. Fuel
   c. Heat
   d. all of the above
   e. none of the above

3. Heat sources could include

   a. hot surfaces
   b. sparks and arcs
   c. electrical energy
   d. friction
   e. all of the above

4. Propane, butane, and acetylene are examples of which class of fuel?

   a. Gases
   b. Liquids
   c. Solids
   d. Electrical energy

5. Alcohol, varnish, and paint are examples of which class of fuel?

   a. Gases
   b. Liquids
   c. Solids
   d. Chemical chain reaction

6. Solid fuels include

   a. paper
   b. plastic
   c. grain
   d. cloth
   e. all of the above

7. Draw the three (3) sides of the fire triangle and label each side.

FIRE PREVENTION
SELF-TEST 2

1. The vaporized products of combustion, or burning, are known as

   a. fire gases
   b. flames
   c. heat
   d. smoke

2. Property damage, painful injuries, and permanent scarring are examples of the dangers of

   a. fire gases
   b. flames
   c. smoke
   d. thermal decomposition products

3. A type of energy measured in degrees of temperature and responsible for the spread of fire is known as

   a. fire gases
   b. flames
   c. heat
   d. thermal decomposition products

4. Smoke is dangerous because

   a. it reduces your visibility in a fire emergency
   b. it can damage your lungs
   c. it can kill you if you breathe enough of it
   d. all of the above
   e. none of the above

5. "Other gases and materials that result when a substance burns or is heated beyond a certain temperature" defines

   a. fire gases
   b. flames
   c. smoke
   d. thermal decomposition products

FIRE PREVENTION
SELF-TEST 3

1. List five (5) common causes of industrial fires.

____

____

____

____

____

2. Give three (3) reasons for friction as a cause of industrial fires.

____

____

____

3. State two (2) ways to prevent a fire caused by mechanical sparks.

____

____

FIRE PREVENTION
SELF-TEST 4

1. List five (5) of the objectives of an Emergency Action Plan, as outlined in 29 CFR 1910.38.

    a. ______________________________

    ____

    b. ______________________________

    ____

    c. ______________________________

    ____

    d. ______________________________

    ____

    e. ______________________________

    ____

2. List three (3) of the objectives of a Fire Prevention Plan, as outlined in 29 CFR 1910.38.

    a. ______________________________

    ____

    b. ______________________________

    ____

    c. ______________________________

    ____

FIRE PREVENTION
SELF-TEST 5

1. Smoke coming from the electric motor of an air compressor is an example of which class of fire?

   a. Class A
   b. Class B
   c. Class C
   d. Class D

2. Spilled gasoline ignited by flames from a gas water heater is an example of which class of fire?

   a. Class A
   b. Class B
   c. Class C
   d. Class D

3. An electric hot plate left unattended ignites papers on a bulletin board and spreads to wood paneling. This is an example of which class of fire?

   a. Class A
   b. Class B
   c. Class C
   d. Class D

4. Burning metal spilled from its carrying container is an example of which class of fire?

   a. Class A
   b. Class B
   c. Class C
   d. Class D

FIRE PREVENTION
SELF-TEST 6

1. A fire extinguisher suitable for use with ordinary combustibles will have which letter symbol?

   ____

2. A fire extinguisher suitable for use with flammable liquids and electrical equipment will have which letter symbols?

   ____

3. A fire extinguisher labeled with the letters "AB" can be used on which classes of fires?

   ____

4. The letter "C" shows that the fire extinguisher is suitable for which class of fire?

   ____

5. What is the color of the letter symbol on a fire extinguisher suitable for use on combustible metals?

   ____

FIRE PREVENTION
ANSWERS TO SELF-TESTS

NOTE: Check the appropriate pages in this unit for more information or explanations.

SELF-TEST 1

1. b; 2. d; 3. e; 4. a; 5. b; 6. e; 7. oxygen, heat, fuel

SELF-TEST 2

1. a; 2. b; 3. c; 4. d; 5. d

SELF-TEST 3

1. Any five (5) causes

2. Any three (3) reasons

3. Any two (2) prevention steps

SELF-TEST 4

1. Any five (5) objectives

2. Any three (3) objectives

SELF-TEST 5

1. c; 2. b; 3. a; 4. d

SELF-TEST 6

1. A; 2. BC; 3. ordinary combustibles and flammable liquids; 4. electrical equipment; 5. yellow